**ATTACHMENT 2 (e)**

**Course Specifications**

**Kingdom of Saudi Arabia**

**The National Commission for Academic Accreditation & Assessment**

# Course Specifications
# (CS)

# Course Specifications

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| Institution Al-Yamamah University | Date of Report: October 2013 |
| College/Department Computer and Information Systems | |

## A. Course Identification and General Information

1. Course title and code: SWE 401 Software Quality Assurance

2. Credit hours 3+0

3. Program(s) in which the course is offered.
(If general elective available in many programs indicate this rather than list programs)

BCIS Software Engineering Concentration

4. Name of faculty member responsible for the course

Dr. Raed Shatnawi

5. Level/year at which this course is offered

Fourth year

6. Pre-requisites for this course (if any)

SWE 312

7. Co-requisites for this course (if any)
None

8. Location if not on main campus

9. Mode of Instruction (mark all that apply)

| | | | |
|---|---|---|---|
| a. Traditional classroom | X | What percentage? | 100 |
| b. Blended (traditional and online) | | What percentage? | |
| c. e-learning | | What percentage? | |
| d. Correspondence | | What percentage? | |
| f. Other | | What percentage? | |

Comments:

## B Objectives

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| 1. What is the main purpose for this course?<br><br>The purpose of this course is to show the importance and significance of software quality in producing successful software. Several software quality standards exist and following one or more of these standards is vital to produce high quality software, within budget, and time constraints. |
| 2. Briefly describe any plans for developing and improving the course that are being implemented. (e.g. increased use of IT or web based reference material, changes in content as a result of new research in the field)<br><br>The course should include one or more case studies from industrial settings and commercial if possible. New versions of software quality standards can be included. |

## C. Course Description (Note: General description in the form to be used for the Bulletin or handbook should be attached)

Quality assurance is viewed as an activity that runs through the entire development process: understanding the needs of clients and users; analyzing and documenting requirements; Including Quality concepts — Software quality assurance - Software quality management Quality planning and control — Software reviews, walkthrough and inspection— Statistical software quality assurance — Software configuration management- Software reliability — International Software quality models, e.g. ISO9000Quality standards and ISO 9000-3, etc.. — Software process improvement — The Capability Maturity Model (CMM), Balance scorecards.

1. Topics to be Covered

| List of Topics | No. of Weeks | Contact Hours |
|---|---|---|
| Overview.<br><br>▪ Meeting People's Quality Expectations. | 1 | 3 |
| What Is Software Quality?<br><br>▪ Quality: Perspectives and Expectations.<br>▪ Quality Frameworks and ISO-9126.<br>▪ Correctness and Defects: Definitions, Properties, and Measurements.<br>▪ A Historical Perspective of Quality.<br>▪ What Is Software Quality? | 1 | 3 |

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| Quality Assurance.<br>▪ Classification: QA as Dealing with Defects.<br>▪ Defect Prevention.<br>▪ Education and training.<br>▪ Formal method.<br>▪ Other defect prevention techniques.<br>▪ Defect Reduction.<br>▪ Inspection: Direct fault detection and removal.<br>▪ Testing: Failure observation and fault removal.<br>▪ Other techniques and risk identification.<br>▪ Defect Containment.<br>▪ Software fault tolerance.<br>▪ Safety assurance and failure containment. | 2 | 6 |
| Quality Assurance in Context.<br>▪ Handling Discovered Defect During QA Activities.<br>▪ QA Activities in Software Processes.<br>▪ Verification and Validation Perspectives.<br>▪ Reconciling the Two Views. | 1 | 3 |
| Quality Engineering.<br>▪ Quality Engineering: Activities and Process.<br>▪ Quality Planning: Goal Setting and Strategy Formation.<br>▪ Quality Assessment and Improvement.<br>▪ Quality Engineering in Software Processes. | 1 | 3 |
| SOFTWARE TESTING.<br>▪ Testing: Concepts, Issues, and Techniques.<br>▪ Purposes, Activities, Processes, and Context.<br>▪ Questions about Testing.<br>▪ Functional vs. Structural Testing: What to Test?<br>▪ Coverage-Based vs. Usage-Based Testing: When to Stop Testing? | 1 | 3 |
| Presentations<br>▪ Case studies or projects assigned to students | 1 | 3 |
| Defect Prevention and Process improvement.<br>▪ Basic Concepts and Generic Approaches.<br>▪ Root Cause Analysis for Defect Prevention.<br>▪ Education and Training for Defect Prevention.<br>▪ Other Techniques for Defect Prevention.<br>▪ Analysis and modeling for Defect Prevention.<br>▪ Technologies, standards, and methodologies for defect prevention.<br>▪ Software tools to block defect injection.<br>▪ Focusing on Software Processes. | 1 | 3 |

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| Formal Verification.<br><br>▪ Basic Concepts: Formal Verification and Formal Specification.<br>▪ Formal Verification: Axiomatic Approach.<br>▪ Formal logic specifications.<br>▪ Axioms.<br>▪ Axiomatic proofs and a comprehensive example.<br>▪ Other Approaches.<br>▪ Weakest pre-conditions and backward chaining.<br>▪ | 2 | 6 |
| Fault Tolerance and Failure Containment.<br><br>▪ Basic Ideas and Concepts.<br>▪ Fault Tolerance with Recovery Blocks.<br>▪ Fault Tolerance with N-Version Programming.<br>▪ NVP: Basic technique and implementation. | 2 | 6 |
| Comparing Quality Assurance Techniques and Activities.<br><br>▪ General Questions: Cost, Benefit, and Environment.<br>▪ Applicability to Different Environments.<br>▪ Effectiveness Comparison.<br>▪ Defect perspective.<br>▪ Problem types.<br>▪ Defect level and pervasive level.<br>▪ Result interpretation and constructive information.<br>▪ Cost Comparison. | 1 | 3 |
| Quality Models and Measurements.<br><br>▪ Models for Quality Assessment.<br>▪ Generalized Models.<br>▪ Product-Specific Models.<br>▪ Model Comparison and Interconnections. | 1 | 3 |
| TOTAL | 15 | 45 |

| 2. Course components (total contact hours and credits per semester): | | | | | | |
|---|---|---|---|---|---|---|
| | Lecture | Tutorial | Laboratory | Practical | Other: | Total |
| Contact Hours | 45 | - | - | - | | 45 |
| Credit | 3 | - | - | - | | 3 |

| 3. Additional private study/learning hours expected for students per week. | 6 |
|---|---|

4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy

Course Learning Outcomes, Assessment Methods, and Teaching Strategy work together and are aligned. They are joined together as one, coherent, unity that collectively articulate a consistent agreement between student learning, assessment, and teaching.

The ***National Qualification Framework*** provides five learning domains. Course learning outcomes are required. Normally a course has should not exceed eight learning outcomes which align with one or more of the five learning domains. Some courses have one or more program learning outcomes integrated into the course learning outcomes to demonstrate program learning outcome alignment. The program learning outcome matrix map identifies which program learning outcomes are incorporated into specific courses.

On the table below are the five NQF Learning Domains, numbered in the left column.

**First**, insert the suitable and measurable course learning outcomes required in the appropriate learning domains (see suggestions below the table). **Second**, insert supporting teaching strategies that fit and align with the assessment methods and intended learning outcomes. **Third**, insert appropriate assessment methods that accurately measure and evaluate the learning outcome. Each course learning outcomes, assessment method, and teaching strategy ought to reasonably fit and flow together as an integrated learning and teaching process. **Fourth**, if any program learning outcomes are included in the course learning outcomes, place the @ symbol next to it.

Every course is not required to include learning outcomes from each domain.

| | NQF Learning Domains And Course Learning Outcomes | Course Teaching Strategies | Course Assessment Methods |
|---|---|---|---|
| **1.0** | **Knowledge**<br>After successful completion of the course students will be able to | | |
| 1.1 | Recognize the concept of Software quality assurance. | This knowledge will be imparted via a combination of formal lectures. | Written exams (quizzes, mid-term, and final exams) |
| 1.2 | List, define and describe various Software quality methods and attributes. | Group discussion and case studies, free reading. | Oral presentations |
| 1.3 | Define the software quality assurance and improvement process and activities | A practical project. | Project Assignments/ Homework |
| **2.0** | **Cognitive Skills**<br>After successful completion of the course students will be able to | | |
| 2.1 | The ability to explain, compare and contrast the different aspects and standards of software quality | Achieving these skills will be developed by a combination of formal lectures, group discussion and case studies, free reading, and a practical project. | Continues assessments during the semester:<br>• Quizzes<br>• Assignment<br>• Class participation<br>• Presentations |
| 2.2 | Analyze existing successful and unsuccessful case studies | tutorials | Analysis of cases<br>Project work |
| **3.0** | **Interpersonal Skills & Responsibility**<br>After successful completion of the course students will be able to | | |
| 3.1 | • The ability to cooperate constructively in groups.<br>• Students should demonstrate how using specific tools from open-source and commercial domains to search for new information, data and techniques of analysis. | • Students are required to perform presentations either individually or in groups to meet specific requirements of some assignments.<br>• Project and assignments are designed to include tasks that require students to evaluate software quality. | • Presentations |
| 3.2 | Students should be aware of ethical and professional values and moral judgments.<br>The ability to practice values relevant to the professional code. | • Students will be exposed to ethical and professional issues throughout the course. | • Presentations |
| **4.0** | **Communication, Information Technology, Numerical**<br>After successful completion of the course students will be able to | | |
| 4.1 | • The ability to communicate effectively in oral and written English.<br>• The ability to effectively search the web using top rated search engines and verified searching techniques. | Course work, project, and assignments will implement tasks that support the above mentioned skills throughout the course. | • Presentations |

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| 4.2 | • The ability to use the Al-Yamamah University information systems, such as: Students' email system, Students' Absence system (EDUGATE), Al-Yamamah Electronic Community (YEC), and e-registry. | | • Presentations |
| **5.0** | **Psychomotor**<br>After successful completion of the course students will be able to | | |
| 5.1 | None | None | None |

**Suggested Guidelines for Learning Outcome Verb, Assessment, and Teaching**

| NQF Learning Domains | Suggested Verbs |
|---|---|
| | |
| **Knowledge** | list, name, record, define, label, outline, state, describe, recall, memorize, reproduce, recognize, record, tell, write |
| **Cognitive Skills** | estimate, explain, summarize, write, compare, contrast, diagram, subdivide, differentiate, criticize, calculate, analyze, compose, develop, create, prepare, reconstruct, reorganize, summarize, explain, predict, justify, rate, evaluate, plan, design, measure, judge, justify, interpret, appraise |
| **Interpersonal Skills & Responsibility** | demonstrate, judge, choose, illustrate, modify, show, use, appraise, evaluate, justify, analyze, question, and write |
| **Communication, Information Technology, Numerical** | demonstrate, calculate, illustrate, interpret, research, question, operate, appraise, evaluate, assess, and criticize |
| **Psychomotor** | demonstrate, show, illustrate, perform, dramatize, employ, manipulate, operate, prepare, produce, draw, diagram, examine, construct, assemble, experiment, and reconstruct |

Suggested ***verbs not to use*** when writing measurable and assessable learning outcomes are as follows:

| | | | | | | |
|---|---|---|---|---|---|---|
| Consider | Maximize | Continue | Review | Ensure | Enlarge | Understand |
| Maintain | Reflect | Examine | Strengthen | Explore | Encourage | Deepen |

Some of these verbs can be used if tied to specific actions or quantification.

**Suggested assessment methods and teaching strategies are:**

According to research and best practices, multiple and continuous assessment methods are required to verify student learning. Current trends incorporate a wide range of rubric assessment tools; including web-based student performance systems that apply rubrics, benchmarks, KPIs, and analysis. Rubrics are especially helpful for qualitative evaluation. Differentiated assessment strategies include: exams, portfolios, long and short essays, log books, analytical reports, individual and group presentations, posters, journals, case studies, lab manuals, video analysis, group reports, lab reports, debates, speeches, learning logs, peer evaluations, self-evaluations, videos, graphs, dramatic performances, tables, demonstrations, graphic organizers, discussion forums, interviews, learning contracts, antidotal notes, artwork, KWL charts, and concept mapping.

Differentiated teaching strategies should be selected to align with the curriculum taught, the needs of students, and the intended learning outcomes. Teaching methods include: lecture, debate, small group work, whole group and small group discussion, research activities, lab demonstrations, projects, debates, role playing, case studies, guest speakers, memorization, humor, individual presentation, brainstorming, and a wide variety of hands-on student learning activities.

5. Schedule of Assessment Tasks for Students During the Semester

| | Assessment task (e.g. essay, test, group project, examination, speech, oral presentation, etc.) | Week Due | Proportion of Total Assessment |
|---|---|---|---|
| 1 | Project and presentation | 14 | 20% |
| 2 | Quizzes | 2, 4, 7, 10, 14 | 10% |
| 3 | Midterm exam | 8 | 20% |
| 4 | Punctuality and Attendance | | 10% |
| 5 | Final exam | 16 | 40% |

## D. Student Academic Counseling and Support

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| 1. Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice. (include amount of time teaching staff are expected to be available each week)<br><br>All faculties are required to assign in average 8 office hours every week dedicated for individual student consultations and academic advice. The schedule of the office hours are posted on faculty office door. |

## E. Learning Resources

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| 1. List Required Textbooks<br><br>Textbook: Jeff Tian, Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, John Wiley and Sons, Inc., and IEEE Computer Society Press. 2005. ISBN: 0-471-71345-7. |
| 2. List Essential References Materials (Journals, Reports, etc.)<br><br>• NASA Software Assurance http://software.nasa.gov/<br>• GSFC Software Assurance http://sw-assurance.gsfc.nasa.gov<br>• GSFC Software Development Process Improvement http://software.gsfc.nasa.gov<br>• NASA Technical Standards http://standards.nasa.gov/ |
| 3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)<br>• Stephen H. Kan, Metrics and Models in Software Quality Engineering, 2nd edition, 2004. ISBN: 0-201-72915-6<br>• Murali Chemuturi, Mastering Software Quality Assurance: Best Practices, Tools and Techniques for Software Developers, (Jul 30, 2010) .<br>• Emest Wall Muller, Software Quality Assurance: A practical approach, Prentice Hall. 1994.. |
| 4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.)<br>• Carnegie Mellon-Software Engineering Institute http://www.sei.cmu.edu/<br>• R. S. Pressman and Associates http://www.rspa.com/spi/SQA.html |
| 5. Other learning material such as computer-based programs/CD, professional standards or regulations and software.<br><br>JUnit Testing package under Eclipse to help students doing projects and assignments.<br>Google Quality tools as a demo of software quality assessment tools. |

## F. Facilities Required

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| Indicate requirements for the course including size of classrooms and laboratories (i.e. number of seats in classrooms and laboratories, extent of computer access etc.) |
| 1. Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)<br><br>One lecture room and one lab with 24 PCs and Internet connection. An overhead projector is normally installed in every class and lab throughout the university campuses. |

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| 2. Computing resources (AV, data show, Smart Board, software, etc.)<br><br>Real applications and successful case study stories. |
| 3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list)<br><br>PCs are required to run the testing and quality software tools by students throughout the semester. |

## G Course Evaluation and Improvement Processes

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| 1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching<br><br>During the course, students receive a feedback forms that covers all aspects relating to their learning experience. These forms will then be collected and analysed by the Academic Advising and Counselling Department. Next, the Academic Advising and Counselling Department will conduct a meeting with the concerned faculty to discuss the students' feedback outcomes. |
| 2 Other Strategies for Evaluation of Teaching by the Program/Department Instructor<br><br>Peer review visits are normally conducted among faculties wherever possible during academic year. During the lecture time Chair (Head)/ Dean of the department visits the classroom. At the end of each visit, faculties are usually set together to discuss related issues. |
| 3 Processes for Improvement of Teaching<br><br>Feedbacks from students using different types of survey are shown and discussed with faculty members to improve the teaching. |
| 4. Processes for Verifying Standards of Student Achievement (e.g. check marking by an independent member teaching staff of a sample of student work, periodic exchange and remarking of tests or a sample of assignments with staff at another institution)<br><br>Peer review and discussion with course coordinator. There should be a strong liaison with teacher from some external university/institute in order to exchange ideas related to marking/ evaluating quizzes and assignments. |

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| 5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.<br><br>At the end of each semester, Curriculum committee conducts a meeting with all faculty members in which surveys filled by the students and other feedbacks from faculty members are discussed. Effectiveness of the courses, mistakes done and weaknesses are discussed. These points are made basis for the planning for improvements for next semester/ year. |

**Faculty or Teaching Staff: Dr. Raed Amin Shatnawi**

**Signature: _____** **Date Report Completed: _____**

**Received by: _____** **Dean/Department Head**

**Signature: _____** **Date: _____**