



ATTACHMENT 2 (e)

Course Specifications

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

**Course Specifications
(CS)**



Course Specifications

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 402 Software Maintenance & Evolution			
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 301 Software Requirements Engineering			
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	<input checked="" type="checkbox"/>	What percentage?	<input type="text" value="100"/>
b. Blended (traditional and online)	<input type="checkbox"/>	What percentage?	<input type="text"/>
c. e-learning	<input type="checkbox"/>	What percentage?	<input type="text"/>
d. Correspondence	<input type="checkbox"/>	What percentage?	<input type="text"/>
f. Other	<input type="checkbox"/>	What percentage?	<input type="text"/>
Comments:			



B Objectives

<p>1. What is the main purpose for this course?</p> <p>The course teaches students the principles of software maintenance and evolution that leads to long term software production. The course aims to develop large software with cost-effective approaches.</p>
<p>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)</p> <p>Use of LMS(Learning Management System) Refer students to related website.</p>

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

The course Covers issues related to change management in software systems. Addresses principles and techniques of corrective software maintenance, software enhancements, and software product family. Introduces students to issues of change in large software systems including configuration control, change and product management.

1. Topics to be Covered		
List of Topics	No. of Weeks	Contact Hours
<p>Introduction To The Basic Concepts</p> <ul style="list-style-type: none"> ▪ Introduction ▪ Definitions ▪ The Basics ▪ How New Development And Maintenance Activities Differ ▪ Why Software Maintenance Is Needed ▪ Maintaining Systems Effectively ▪ Case Study-Air Traffic Control ▪ Categorising Software Change 	1	3
<p>The Maintenance Framework</p> <ul style="list-style-type: none"> ▪ A Software Maintenance Framework ▪ Components Of The Framework 	1	3
<ul style="list-style-type: none"> ▪ Fundamentals Of Software Change ▪ Software Change ▪ Ongoing Support ▪ Lehman's Laws 	1	3
<p>Limitations And Economic Implications To</p> <ul style="list-style-type: none"> • Software Change • Economic Implications Of Modifying Software 48 • Limitations To Software Change 	1	3



The Maintenance Process <ul style="list-style-type: none"> ▪ The Software Production Process ▪ Critical Appraisal Of Traditional Process Models ▪ Maintenance Process Models ▪ Process Maturity 	1	3
Program Understanding <ul style="list-style-type: none"> ▪ Aims Of Program Comprehension ▪ Comprehension Process Models ▪ Mentalmodels ▪ Program Comprehension Strategies 	1	3
Reverse Engineering <ul style="list-style-type: none"> ▪ Abstraction ▪ Purpose And Objectives Of Reverse Engineering ▪ Levels Of Reverse Engineering 	2	6
Reuse And Reusability <ul style="list-style-type: none"> ▪ The Targets For Reuse ▪ Objectives And Benefits Of Reuse ▪ Approaches To Reuse ▪ Reuse Process Model 	1	3
Management And Organisational Issues <ul style="list-style-type: none"> ▪ Enhancing Maintenance Productivity ▪ Maintenance Teams 	1	3
Configuration Management <ul style="list-style-type: none"> ▪ Change Control ▪ Documentation 	2	6
Maintenance Measures <ul style="list-style-type: none"> ▪ Objectives Of Software Measurement ▪ Example Measures ▪ Size ▪ Complexity ▪ McCabe's Cyclomatic Complexity ▪ Halstead's Measures ▪ Quality ▪ Product Quality ▪ Process Quality 	2	6
Building Better Systems <ul style="list-style-type: none"> ▪ Building And Sustaining Maintainability ▪ Impact Analysis ▪ Maintenance Tools 	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.	3
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4. Course Learning Outcomes in NQF Domains of Learning and Alignment with Assessment Methods and Teaching Strategy
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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 After successful completion of the course students will be able to		
1.1	Recognize the concept of Software maintenance and evolution	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 software configuration management, code change. code analysis techniques and tools	Group discussion and case studies, free reading.	Oral presentations
1.3	Define the software maintenance process and CMMI maturity models.	A practical project.	Project Assignments/ Homework
2.0	Cognitive Skills After successful completion of the course students will be able to		
2.1	The ability to explain and differentiate several aspects and standards of software maintenance, evolution and reengineering	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: • Quizzes • Assignment • Class participation • Presentations
2.2	Analyze and study existing successful and unsuccessful case studies of software evolution in open and closed –source fields	tutorials	Analysis of cases Project work
3.0	Interpersonal Skills & Responsibility After successful completion of the course students will be able to		
3.1	<ul style="list-style-type: none"> The ability to cooperate constructively in groups. 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.	• Presentations
3.2	Students should be aware of ethical and professional values and moral judgments. 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 After successful completion of the course students will be able to		
4.1	<ul style="list-style-type: none"> The ability to communicate effectively in oral and written English. 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
4.2	<ul style="list-style-type: none"> The ability to use the Al-Yamamah University information systems, such as: Students' email system, Students' Absence 		• Presentations



	system (EDUGATE), Al-Yamamah Electronic Community (YEC), and e-registry.		
5.0	Psychomotor After successful completion of the course students will be able to		
5.1	None	None	None
5.2			

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

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)

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

1. List Required Textbooks

Tom Mens and Serge Demeyer, Software Evolution, Springer, (Nov 19, 2010). ISBN: 3540764402

2. List Essential References Materials (Journals, Reports, etc.)

- Software Maintenance Concepts and Practice, Penny Grubb and Armstrong A Takang, 2nd Edition, 2003, ISBN 978-981-238-425-6
<http://www.worldscientific.com/worldscibooks/10.1142/5318>
- Software Maintenance: Effective Practices for Geographically Distributed, Gopaldaswamy Ramesh, Rames
http://books.google.com.sa/books?id=hoV4Wn0WDY8C&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false

3. List Recommended Textbooks and Reference Material (Journals, Reports, etc)

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- Software Maintenance Management: Evaluation and Continuous Improvement, By Alain April, Alain Abran

4. List Electronic Materials (eg. Web Sites, Social Media, Blackboard, etc.)

- Carnegie Mellon-Software Engineering Institute <http://www.sei.cmu.edu/>
- 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.

Google Quality tools are used to track the evolution of software systems.

F. Facilities Required

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.)

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.



2. Computing resources (AV, data show, Smart Board, software, etc.) Real application and case study stories
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) PCs only are required.

G Course Evaluation and Improvement Processes

1 Strategies for Obtaining Student Feedback on Effectiveness of Teaching 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 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 Specialised workshops and seminars are conducted throughout academic year to address specific teaching strategies and improvements.
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) None.



5 Describe the planning arrangements for periodically reviewing course effectiveness and planning for improvement.

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:** _____