ATTACHMENT 2 (e)

Course Specifications

Kingdom of Saudi Arabia

The National Commission for Academic Accreditation & Assessment

Course Specifications
(CE)

Course Specifications

Institution:	Umm Al-Qura University	Date of Report: 10/06/1437
College/Department: Computer Engineering Department		

A. Course Identification and General Information

1. Course title and code:
   Model-Based Engineering of Embedded Systems 14034215-3
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)
   Computer Engineering
4. Name of faculty member responsible for the course
   Dr. Muhammad Rashid
5. Level/year at which this course is offered: Level 9/10
6. Pre-requisites for this course (if any)
   Digital System Design
7. Co-requisites for this course (if any)
   N/A
8. Location if not on main campus
   Umm Al-Qura University, Abidiyyah, Makkah Al-Mukarammah
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:
N/A

B Objectives

1. What is the main purpose for this course? • Introduction to basic terminologies used in Model Based System Engineering (MBS) • Generation of technical specifications from user specifications • Introduction to system modeling using SysML. • Use of various case studies such as traffic light controller, automotive door control unit • Code generation from SysML models • Simulation of the automatically generated code on an embedded platform
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) • Involving students in presentation of different topics in Model Based System Engineering (MBS). • Lecture slides and tutorials, animations to further clarify the theoretical concepts • Use of SysML models for simulating and automatically generating code on an embedded platform.

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

1. Topics to be Covered

List of Topics	No. of Weeks	Contact Hours
Introduction to basic terminologies used in Model Based System Engineering (MBS) for the development of embedded systems	1-3	9
Generation of technical specifications from user specifications (Instructor is supposed to provide examples from computer engineering discipline)	4-6	9
Introduction to system modeling using SysML. Use of various case studies such as traffic light controller, automotive door control unit and so on to demonstrate the concepts	7-9	9
Code generation from SysML models by demonstrating the concepts of meta modeling. Illustration of concepts with examples	10-12	9
Simulation of the automatically generated code on an embedded platform	13-14	6

2. Course components (total contact hours and credits per semester):						
	Lecture	Tutorial	Laboratory	Practical	Other:	Total
Contact Hours	42	N/A	N/A	N/A	N/A	42
Credit	42	N/A	N/A	N/A	N/A	42

3. Additional private study/learning hours expected for students per week.	08

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**		
1.1	Model based system engineering, Requirement specifications, System Modeling, Model Transformation, Meta Modeling, Code generation, Validation, Simulation.	Classroom lectures, power point slides and individual attention is used to develop knowledge of the course.	Exercises & Home works, Quizzes, Midterm, Project , Final Exam, Review outputs from the assignments in the computer lab and also from their assignments and projects.
2.0	**Cognitive Skills**		
2.1	Ability to code model in SysML. Ability to understand system modeling. Ability to analyze and simulate automatically generated code on an embedded platform	Assignments and projects	Mid term, final exam and labs.
3.0	**Interpersonal Skills & Responsibility**		
3.1	To understand and communicate to others the importance and relevance of statistics in the modern world Be an independent learner, able to acquire further knowledge with some guidance or support. Participate in group discussions Manage time and meet deadlines.	Technical Assignments Students Presentations Simulation problems to enable students to understand the concepts	Mid and Final Exams Tutorials Projects
4.0	**Communication, Information Technology, Numerical**		
4.1	Case studies: the key method of discovering a student's dexterity in analyzing. Their recommendations, opinions and suggestions. Assignments, exams, reports,	Written Examinations Assignments Quizzes	Assignments, exams, reports, presentations and quizzes will test their analytic skills and communication skills

	presentations and quizzes will test their analytic skills and communication skills. Class discussions should indicate a student's prowess in responding.		Class discussions should indicate a student's prowess in responding
5.0	**Psychomotor**		
5.1	Model Based System Engineering (MBS) for the development of embedded systems is used in the course for psychomotor skill.	The students are encouraged to design and apply system modeling using SysML to develop psychomotor skills.	The psychomotor skills developed in this course are assessed by assignments, presentations and project.

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	Quizzes	4, 10	10
2	Mid Term	8, 12	20
3	Assignments	Throughout semester	05
4	Project	Throughout semester	25
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) • For individual student consultations and academic advice teaching staff is expected to be available 8 hours per week.

E. Learning Resources

1. List Required Textbooks • A Practical Guide to SysML: The Systems Modeling Language, 2nd Ed., The MK/OMG Press, 2011
2. List Essential References Materials (Journals, Reports, etc.) • N/A
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) • N/A
4. List Electronic Materials (e.g. Web Sites, Social Media, Blackboard, etc.) • N/A
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. • N/A

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.) • A Lecture room having Multimedia projector for lectures and students presentation.

2. Computing resources (AV, data show, Smart Board, software, etc.) • Computer lab available for practical networking and for simulations. • Students are encouraged to bring in their laptops and use them in solving problems in the class room.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) • N/A

G Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • Course Survey and students Feedback for each learning outcome of the course.
2. Other Strategies for Evaluation of Teaching by the Program/Department Instructor • Faculty meetings to discuss best practices and issues related to the course • Comparison of the course content with similar courses offered in others colleges • Updating course curriculum according to latest research done in the field
3. Processes for Improvement of Teaching • Departmental meetings. • Faculty trainings.
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) • N/A

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

- The course planning, periodically reviewing and planning for improvement were carried out during the departmental meetings.

Faculty or Teaching Staff: _____

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

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

Signature: _____ **Date: _____**