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:
   Principles of VLSI Design 14034211-3
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. Turki Al-Somani
5. Level/year at which this course is offered: Level 9/10 (Elective)
6. Pre-requisites for this course (if any)
   Electronic Circuits
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?

- Understanding of fundamental issues involved in design, manufacturing and testing of digital integrated circuits (ICs).
- Understanding of relationships between MOS transistor representations and models at different levels of IC design hierarchy.
- Understanding of combinational & sequential circuits using MOS circuits, static & dynamic design.
- Understanding interrelationships between device and circuit levels in IC design and analysis.
- MOS IC fabrication, layout and design rules, transistor sizing subsystem design and practical considerations.

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)

- N/A

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
Representation and modelling of characteristics and operation of MOS transistor at System, Component, and Device level.	1-3	9
Relationship between MOS transistor representations and models at different levels of IC design hierarchy, and their limitation.	4-6	9
Design of combinational and sequential circuits using MOS circuits.	7-9	9
Dynamic and static design.	10-12	9
MOS IC fabrication, layout and design rules, stick diagrams, transistor sizing subsystem design and practical considerations.	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	This course provides an understanding of IC design, layout design rules, transistor sizing, sub-system design and practical considerations. Design of combinational and sequential circuits using MOS circuit, static and dynamic designing. Relationships between MOS transistor representations and models at different levels of IC design hierarchy, and their limitations.	Classroom lectures, power point slides and individual attention is used to develop knowledge of the course.	Assessment methods include final exam, mid-term, quizzes, assignments, project & presentations.
2.0	**Cognitive Skills**		
2.1	This course will develop the ability to understand the interrelationships between device and circuit levels in IC design, and corresponding analysis including that of design trade-offs. MOS IC fabrication, layout and design rule, transistor sizing sub-system design and practical considerations.	Practical examples and open ended tasks are used to develop cognitive skills in the students.	Cognitive skills are assessed by using assignments, quizzes and project
3.0	**Interpersonal Skills & Responsibility**		
3.1	In this course project is assigned to the students which is a group activity and play important role to improve students' interpersonal skills and personal and social responsibility.	Group assignments and project are given to develop these skills.	Assessment of students' interpersonal skills is performed by taking exam, report and presentation.
4.0	**Communication, Information Technology, Numerical**		
4.1	To develop skills in this domain circuit designing is given to the students.	Students' are advised to solve assignments & project reports to develop writing skills. Presentations are arranged to give them chance to develop communication skills.	To assess the students numerical and communication skills tests and conducted and presentations are arranged. Some of the marks are allocated for standard presentation.

5.0	**Psychomotor**		
5.1	Circuit designing is used in the course for psychomotor skill.	The students apply different IC designing techniques 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 6 hours per week.

E. Learning Resources

1. List Required Textbooks • S.-M. Kang & Y. Leblebici, CMOS Digital Integrated Circuits: Analysis & Design, 2nd ed., 1999.
2. List Essential References Materials (Journals, Reports, etc.) • N. Weste and K. Eshraghian, Principles of CMOS VLSI Design, Addison Wesley, 1993. • Ken Martin, Digital Integrated Circuit Design, Oxford Press, 2000. • Jan Rabaey, Digital Integrated Circuits; A design Perspective, Prentice Hall, 1996.
3. List Recommended Textbooks and Reference Material (Journals, Reports, etc) • N/A
4. List Electronic Materials (e.g. Web Sites, Social Media, Blackboard, etc.) • http://www.ece.unm.edu/~jimp/vlsi/slides/c1_intro.html • http://en.wikipedia.org/wiki/Integrated_circuit • http://www.vlsitechnology.org/html/ic_software.html • http://lasihomesite.com/ • http://opencircuitdesign.com/
5. Other learning material such as computer-based programs/CD, professional standards or regulations and software. • IC design software is required.

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 and IC design software is required.
3. Other resources (specify, e.g. if specific laboratory equipment is required, list requirements or attach list) • Computer lab and IC design software is reqruied.

G. Course Evaluation and Improvement Processes

1. Strategies for Obtaining Student Feedback on Effectiveness of Teaching • To improve effectiveness of teaching student feedback is obtained in the form of assignments, tests, quizzes, attendance etc.
2. Other Strategies for Evaluation of Teaching by the Program/Department Instructor • The process for improvement of teaching is based on result of student survey and result of student outcomes. Individual attention is provided to weak students.
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 effectiveness is reviewed for planning and improvement on annual basis.

Faculty or Teaching Staff: _____

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

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

Signature: _____ **Date: _____**