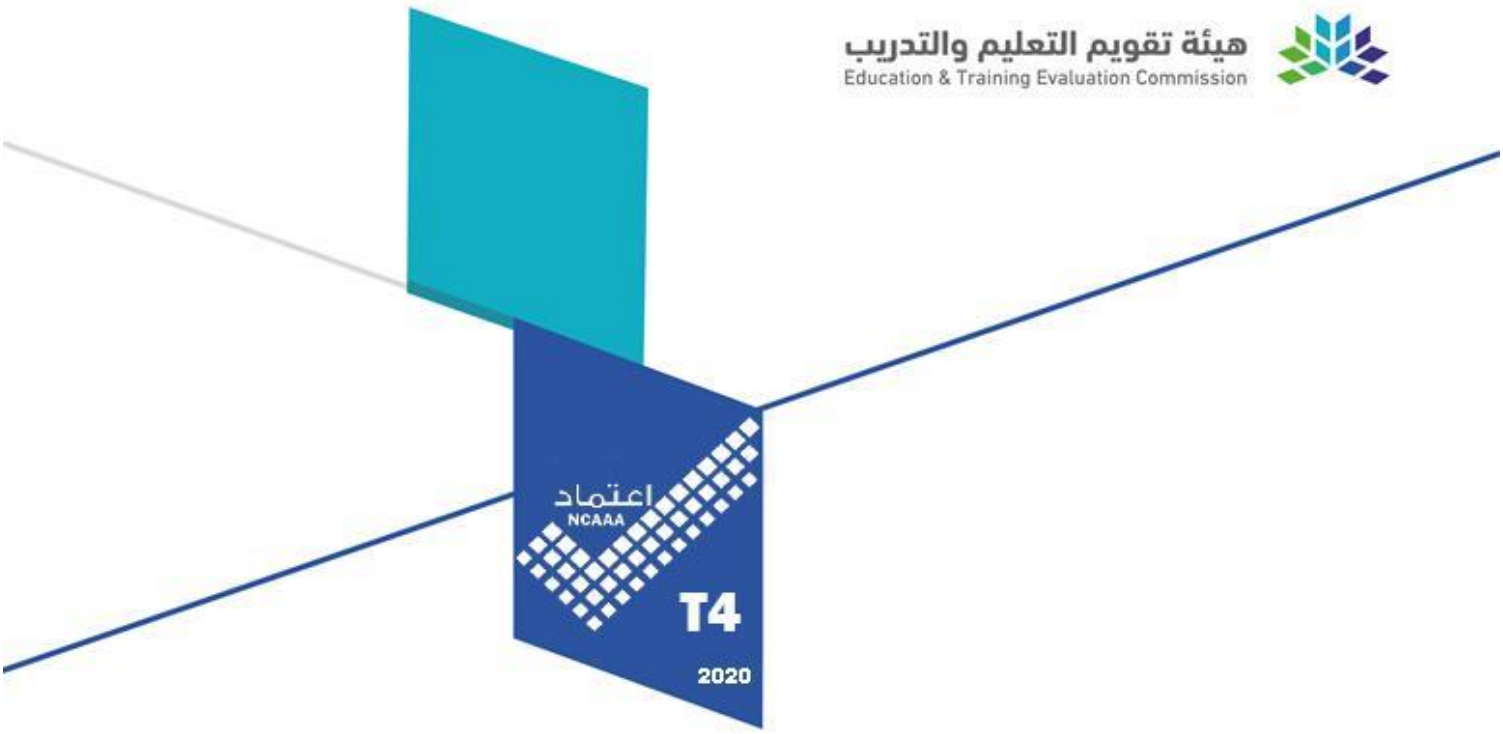
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	VLSI Design
Course Code:	503515-3
Program:	Bachelor in Computer Engineering
Department:	Department of Computer Engineering
College:	College of Computers and Information Technology
Institution:	Taif University

Table of Contents

A. Course Identification

1. Credit hours:3
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: 9/5
4. Pre-requisites for this course (if any)**: 503413-4**
5. Co-requisites for this course (if any)**: NONE**

6. Mode of Instruction (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	**Traditional classroom**	5	100%
2	**Blended**	0	
3	**E-learning**	0	
4	**Distance learning**	0	
5	**Other**	0	

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	45
2	**Laboratory/Studio**	30
3	**Tutorial**	0
4	**Others** (specify)	0
	Total	75

B. Course Objectives and Learning Outcomes

1. Course Description

Introduction to the concepts and techniques of VLSI (Very Large-Scale Integration) design. The VLSI design process, details of the MOS transistor, CMOS processing technology and device fabrication, MOS transistor theory, MOS transistor I-V characteristics, design rules, digital CMOS circuits, and performance estimation. CAD tools for schematic, layout, functionality, timing analysis, synthesis and performance.

2. Course Main Objective

1. Introduce the concepts and techniques of modern integrated circuit design (CMOS VLSI)
2. Develop an understanding of digital design using CMOS
3. Learn how to evaluate the performance of CMOS designs.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge and Understanding**	
1.1	Explain the integrated circuit technology and basic engineering process steps of CMOS.	K1
1.2	Describe the MOS characterization, DC, and transient responses	K1
2	**Skills :**	
2.1	Design combinational/sequential logic circuits using CMOS transistor.	S1
2.2	Illustrate and use the common methods for layout design	S1
2.3	Evaluate the performance of digital CMOS circuits	S3
3	**Values:**	

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to VLSI Semiconductor, BJT, MOS, nMOS, pMOS, CMOS, Logic gates with MOS. Chap 1	3
2	CMOS fabrication. Chap 1	3
3	CMOS Combinational and Sequential Circuits. Chap 1	4
4	CMOS Layout, Layout design rules, Gate layout, Stick diagram. Chap 1 A1.5.3, A1.5.4, A1.5.5, Chap 3, A3.3	5
5	MOS transistor theory, DC Transfer Characteristics. Chap 2	5
6	Delay estimation RC delay model, Elmore delay model, Chap4 A4.2	5
7	Parasitic delay, Examples on Logical effort, Multistage network delay	5
8	Delay in Multistage Logic Networks, Chap4, A 4.3.2	5
9	Power dissipation Dynamic and static power dissipations, Chap4, A4.4	5
10	Power dissipation reduction, Datapath, Chap4, A4.4 (if time permit)	5
11	Lab	30
Total		80

D. Teaching and Assessment

1. Alignment of Course Learning Outcomes with Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
1.0	**Knowledge and Understanding**		
1.1	Explain the integrated circuit technology and basic engineering process steps of CMOS.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.2	Describe the MOS characterization, DC, and transient responses	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
2.0	**Skills**		
2.1	Design combinational/sequential logic circuits using CMOS transistor.	Lecture Discussion	Written Exams Quizzes

Code	Course Learning Outcomes	Teaching Strategies	Assessment Methods
		Projects	Assignments Project Practical Test
2.2	Illustrate and use the common methods for layout design	Lecture Discussion Projects	Written Exams Quizzes Assignments Project Practical Test
3.0	**Values**		
3.1	Evaluate the performance of digital CMOS circuits.	Lecture Discussion Projects	Written Exams Quizzes Assignments Project Practical Test

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Lab Exam	15	20%
2	Midterm Exam	7	20%
3	Assignments and Quizzes	10	10%
4	Final Exam	16	50%

***Assessment task** (i.e., written test, oral test, oral presentation, group project, essay, etc.)

E. Student Academic Counseling and Support

Arrangements for availability of faculty and teaching staff for individual student consultations and academic advice:

Teaching staff provide at least 6 office hours for students to help them in the course as well as in any other academic issues. Also, Faculty members and their students have communication using messages through the university education portal.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Neil H.E. Weste and David Harris, CMOS VLSI Design: A Circuits and Systems Perspective, Addison Wesley, 4th Ed, 2011. Ken Martin, Digital Integrated Circuit Design, Oxford University Press, 2000.
Essential References Materials	Jan M. Rabaey, A. Chandrakasan, B. Nikolic, Digital Integrated Circuits: A Design Perspective, Prentice Hall, 2nd Ed, 2003.
Electronic Materials	

Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Traditional Classrooms, Laboratories
Technology Resources (AV, data show, Smart Board, software, etc.)	White Board. Data show, software
Other Resources (Specify, e.g. if specific laboratory equipment is required, list requirements or attach a list)	

G. Course Quality Evaluation

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect (Survey)
Improvement of teaching	Students	Indirect (Survey)
Verifying standards of student achievement	Faculty	Course Report

Evaluation areas (e.g., Effectiveness of teaching and assessment, Extent of achievement of course learning outcomes, Quality of learning resources, etc.)
Evaluators (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)
Assessment Methods (Direct, Indirect)

H. Specification Approval Data

Council / Committee	Computer Engineering Council / Curriculum Committee
Reference No.	
Date	

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TU
جامعة الطائف
TAIF UNIVERSITY