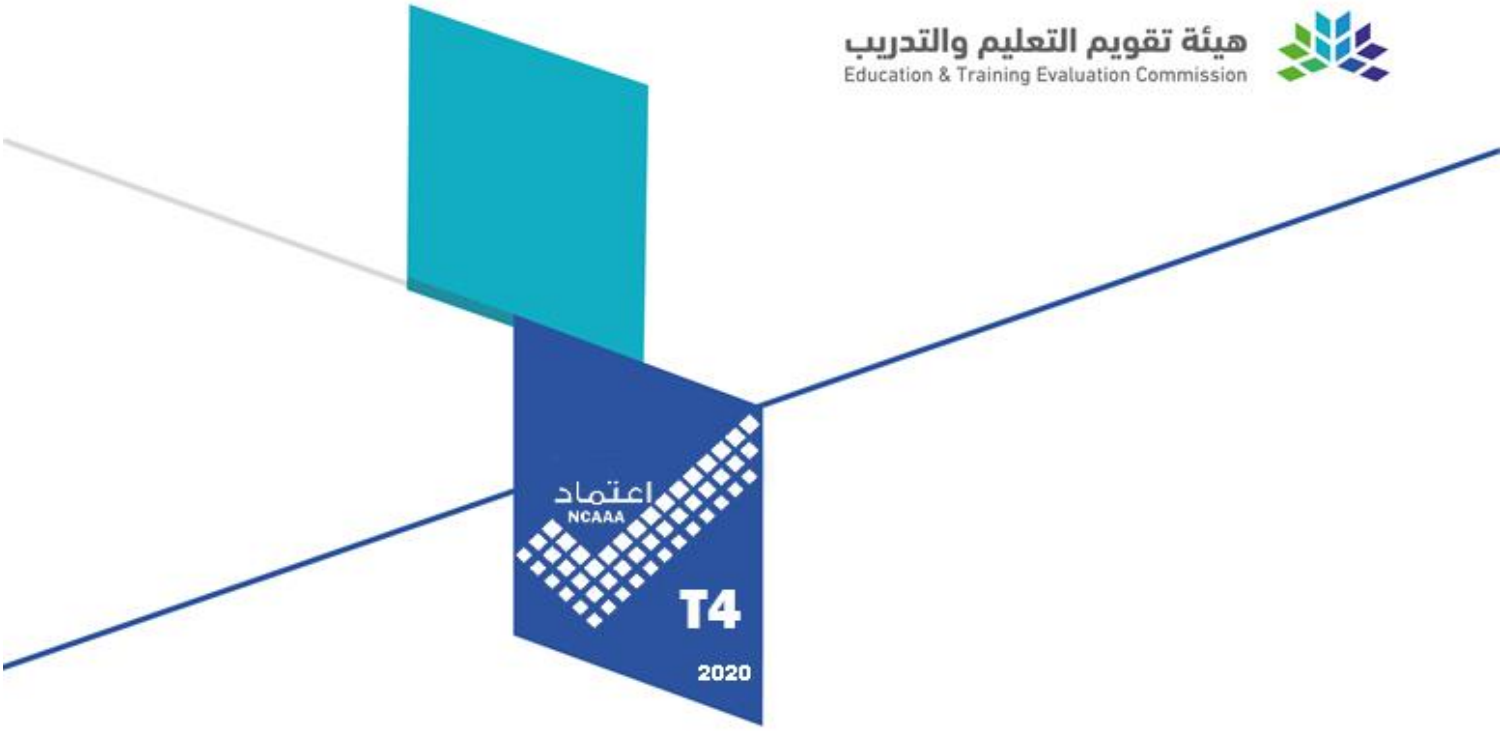
هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission



Course Specifications

Course Title:	Digital System Design
Course Code:	503528-3
Program:	Bachelor in Computer Engineering
Department:	Department of Computer Engineering
College:	College of Computers and Information Technology
Institution:	Taif University

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A. Course Identification

1. Credit hours:5
2. Course type **a.** University ☐ College ☐ Department ■ Others ☐ **b.** Required ■ Elective ☐
3. Level/year at which this course is offered: (13-14-15)th Optional
4. Pre-requisites for this course (if any)**:** Embedded System (503432-3)
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**		
3	**E-learning**		
4	**Distance learning**		
5	**Other**		

7. Contact Hours (based on academic semester)

No	Activity	Contact Hours
1	**Lecture**	50
2	**Laboratory/Studio**	
3	**Tutorial**	
4	**Others** (specify)	
	Total	50

B. Course Objectives and Learning Outcomes

1. Course Description

The objective of this course is to give the students the theoretical basis & practical skills in modern design of medium size digital systems in various technologies, with a focus on Field Programmable Gate Arrays (FPGAs). The design methodology, systematically introduced & used in the course, is based on simulation & synthesis with hardware description language (VHDL) tools. Topics covered in this course include: conceptual design step from requirements & specification to simulation & synthesis model in VHDL, design of complex controllers with Finite State Machines, design of sequential blocks with Controller-Data path methodology, issues in design for testability, electrical & timing issues in logic and system design, overview of implementation technologies with emphasis on advances in FPGAs.

2. Course Main Objective

1. Have a sound knowledge of the digital design process and develop a systematic approach to the design of digital systems.
2. Have good understanding of combinational and sequential circuits.

3. Be able to design a block diagram solution to worded functional description of a medium size digital system
4. Have good understanding of the timing characteristics of devices used in digital systems, and how to determine timing problems in a system and then correct them.
5. Develop a systematic approach to design with simulation, synthesis, and testing of digital systems.
6. Develop solid skills in modern techniques of digital systems design, specifically the use of VHDL (VHSIC Hardware Description Language), FSM state diagrams and control data path methodology.
7. Have good command of modern digital design system such as Xilinx ISE.
8. Have good understanding of Field Programmable Gate array technology for implementation of digital systems.
9. Have appreciation of achievements and limitations of present-day microelectronics technology a perspective for this technology progress.

3. Course Learning Outcomes

CLOs		Aligned PLOs
1	**Knowledge:**	
1.1	Recognize the fundamental concepts of a digital systems design. Identify, formulate, and solve complex engineering problems by applying principles of digital systems design.	K1
1.2	Formulate complex engineering problems by developing a hardware solution based on a block level and structured design methodology.	K1
1.3		
2	**Skills :**	
2.1	Apply engineering design to produce solutions that meet specified needs with consideration of developments and trends in microelectronics	S1
2.2	Apply engineering design to produce solutions that meet specified needs with consideration of optimization technics on the digital systems design	S1
2.3	Apply engineering design system in VHDL integrated with other hardware solutions on FPGA	S1
2.4		
3	**Values:**	
3.1		
3.2		
3.3		
3...		

C. Course Content

No	List of Topics	Contact Hours
1	Introduction to Digital Systems Design and Test	5
2	Review of Combinatorial Circuit Building Blocks VHDL for Combinational Circuits	5

3	Review of VHDL for Sequential Circuits; Guidelines for VHDL based Design and Model Sim Simulation Example	5
4	Programmable Device Technologies and Introduction to the Altera Cyclone IV FPGA	5
5	Memory Implementation on Altera CYCLONE IV Devices	5
6	DE2 LCD Display Controller , DE2 CLOCK with LCD simulation, Exam #1 Sample Questions	5
7	A Simple DE2 Computer Design	5
8	In System Memory Content Editor and Signal Tap II Logic Analyzer and examples	5
9	Clock Networks and Phase Lock Loops on Altera Cyclone IV Devices	5
10	Video Signal Generation for the Altera DE2 Board	5
Total		50

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**		
1.1	Recognize the fundamental concepts of a digital systems design. Identify, formulate, and solve complex engineering problems by applying principles of digital systems design.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.2	Formulate complex engineering problems by developing a hardware solution based on a block level and structured design methodology.	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments
1.3			
2.0	**Skills**		
2.1	Apply engineering design to produce solutions that meet specified needs with consideration of developments and trends in microelectronics	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments Projects
2.2	Apply engineering design to produce solutions that meet specified needs with consideration of optimization technics on the digital systems design	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments Projects
2.3	Apply engineering design system in VHDL integrated with other hardware solutions on FPGA	Lecture Discussion Problem Solving	Written Exams Quizzes Assignments Projects
3.0	**Values**		
3.1			
3.2			
…			

2. Assessment Tasks for Students

#	Assessment task*	Week Due	Percentage of Total Assessment Score
1	Assignments	4,8	10%
2	Quizzes	8,10	10%
3	Projects	10	10%
4	Midterm Exam	6	20%
5	Final Exam	11	50%
6			

***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.

• Consultation can also be done 24 hours/ 7days through university Edugate (Tawasol)

• Consultation can also be done through email which is available at blackboard system.

• academic advice can be done through blackboard system facilities.

F. Learning Resources and Facilities

1.Learning Resources

Required Textbooks	Charles H. Roth, Lizy Kurian John, Digital Systems Design Using VHDL, second edition, Cengage Learning, 2007. 0-534-38462-5
Essential References Materials	Frank Vahid, Roman Lysecky, VHDL for Digital Design, 1st edition, John Wiley & sons inc, 2007.
Electronic Materials	Mark Zwolinski, Digital System Design with VHDL, 1st edition, Prentice Hall, 2000
Other Learning Materials	

2. Facilities Required

Item	Resources
Accommodation (Classrooms, laboratories, demonstration rooms/labs, etc.)	Traditional Classrooms,
Technology Resources (AV, data show, Smart Board, software, etc.)	Data show
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
Extent of achievement of course learning outcomes	Students	Indirect (Survey)

Evaluation Areas/Issues	Evaluators	Evaluation Methods
Effectiveness of teaching and assessment	Students	Indirect (Survey)
Extent of achievement of course learning outcomes	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.	16
Date	4/3/2022

قسم هندسة الحاسب
Computer Engineering Department
TU
جامعة الطائف
TAIF UNIVERSITY