هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification
(Bachelor)

Course Title:	Digital design
Course Code:	COMP-231
Program:	Bachelor of Computer Science
Department:	Computer Science
College:	College of Engineering and Computer Science
Institution:	Jazan University
Version:	V2
Last Revision Date:	31 August 2024

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (.....)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (4th Level / Year 02)					
4. Course general Description:					
This course provides basic concepts of digital systems, review of core design components and circuit design principles. It covers the principles and methodology of digital logic design at the gate and switch level, including both combinational and sequential logic elements. It covers the topics of number system, Boolean algebra and switching theory, combinational circuits design using multiplexers, decoders, comparators and adders.					
5. Pre-requirements for this course (if any)**:**					
Nil					
6. Pre-requirements for this course (if any)**:**					
Nil					
7. Course Main Objective(s):					
• Understand the digital hardware concept and basic logic gates. • Learn the theoretical groundworks of digital design: the Boolean algebra and finite state machines. • Implement the design of combinational and sequential logic circuits. • Discuss the basic understanding of digital components, building blocks and arithmetic algorithms.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	60	100%
2	E-learning		
3	Hybrid		

No	Mode of Instruction	Contact Hours	Percentage
	• Traditional classroom • E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)

No	Activity	Contact Hours
1.	**Lectures**	28
2.	**Laboratory/Studio**	28
3.	**Field**	
4.	**Tutorial**	
5.	**Others (specify)**	4
Total		

B. Course Learning Outcomes (CLOs), Teaching Strategies and Assessment Methods

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
1.0	**Knowledge and understanding**			
1.1	**Describe** the digital system and their usage in computing science.	**K1**	Visual & Verbal **[Lectures/Presentations]**	Assignment-1, Midterm Exam, Final Theory Exam
1.2	**Relate** number systems and their conversion with coding schemes.	**K1**	Visual & Verbal **[Lectures/Presentations]**	Assignment-1, Midterm Exam, Final Theory Exam
1.3	**Explain** Boolean expressions and their simplification using axiomatic properties and K-Map.	**K1**	Visual & Verbal **[Lectures/Presentations]**	Assignment-1, Assignment-2, Final Theory Exam
2.0	**Skills**			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
2.1	**Apply** Boolean algebra using basic and universal logic gates.	**S1**	Visual & Verbal **[Lectures/Lab Sessions]**	Assignment-1, Assignment-2, Final Theory Exam
2.2	**Discriminate** between Combinational and Sequential circuit and their use in digital systems.	**S2**	Visual & Verbal **[Lectures/Lab Sessions]**	Final Lab Exam, Final Theory Exam
3.0	**Values, autonomy, and responsibility**			
3.1	**Demonstrate** the ability to work in team to solve a common problem.	**V2**	Group Discussion, Team Activity	Assignment-2

C. Course Content

No	List of Topics	Contact Hours
1.	**Digital Systems and Binary Numbers** Digital computer and digital systems, binary, decimal, octal and hexadecimal number systems, number base conversion, complements, signed and unsigned numbers, binary codes, binary storages and registers, and binary logic.	**6T + 6P**
2.	**Boolean algebra and logic gates:** Basic definitions, axioms definitions of Boolean algebra, basic theorem and properties of Boolean algebra, Boolean functions, canonical and standard forms, logic operations, and digital logic gates.	**4T + 4P**
3.	**Gate-Level Minimization** Introduction, The Map Method, Four-Variable K-Map, Product-of-Sums Simplification, Don't-Care Conditions, NAND and NOR Implementation, Other Two-Level Implementations Exclusive-OR Function, Hardware Description Language	**4T + 4P**
4.	**Combinational Logic** Combinational Circuits, Analysis Procedure, Design Procedure, Binary Adder-Subtractor, Decimal Adder, Binary Multiplier, Magnitude Comparator, Decoders, Encoders, Multiplexers, HDL Models of Combinational Circuits	**4T + 4P**
5.	**Synchronous Sequential Logic** Introduction, Sequential Circuits, Storage Elements: Latches, Storage Elements: Flip-Flops, Analysis of Clocked Sequential Circuits,	**6T + 6P**

	Synthesizable HDL Models of Sequential Circuits, State Reduction and Assignment, Design Procedure	
6.	**Registers and Counters** Registers, Shift Registers, Ripple Counters, Synchronous Counters, Other Counters, HDL for Registers and Counters	**4T + 4P**
Total		**28T + 28P**

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Mid-Exam	8th Week	15%
2.	Assignment-1	5th Week	10%
3.	Assignment-2	11th Week	15%
4.	Lab Exam	15th Week	20%
5.	Final Theory Exam	16th Week	40%

*Assessment Activities (i.e., Written test, oral test, oral presentation, group project, essay, etc.).

E. Learning Resources and Facilities

1. References and Learning Resources

Essential References	M. Morris Mano, Michael D. Ciletti , "Digital Design: With an Introduction to the Verilog HDL, VHDL and System Verilog", Pearson Publications, 6th edition 2014, ISBN-13: 978-9353062019
Supportive References	• Ronald J, Tocci, Neal S. Widmer, and Gregory L. Moss, "Digital Systems: Principles and Applications" , 11th Edition, 2011, Prentice Hall, ISBN-13: 978-0135103821 • Stephen Brown, Zvonko Vranesic, "Fundamentals of Digital Logic with Verilog Design",3rd Edition, McGraw Hill, 2014, ISBN-13: 978-0073380544
Electronic Materials	• https://www.whoishostingthis.com/resources/vhdl/ • http://www.verilog.com/ • https://www.coursera.org/learn/digital-systems • https://www.allaboutcircuits.com/textbook/digital/
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	• Classroom equipped with projector, smartboard, and sufficient seating arrangements.

Items	Resources
	• Lab with software installed and an individual computer terminal for each student.
Technology equipment (projector, smart board, software)	• smartboards and projectors for classroom and labs • Following software for lab work: Netbeans, MATLAB
Other equipment (depending on the nature of the specialty)	None

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Students	Indirect (Course evaluation survey form)
Effectiveness of Students assessment	CRC / QAU / HoD	Direct (Course reports / result analysis)
Quality of learning resources	Track leaders / CRC	Indirect (Review, meetings, and star rating with suggestions for further modification and improvements)
The extent to which CLOs have been achieved	CRC / QAU	Direct (CLO assessment template further verified at course coordinator, Track leader and QAU level)
Other		

Assessors (Students, Faculty, Program Leaders, Peer Reviewer, Others (specify)

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	DEPARTMENT COUNCIL
REFERENCE NO.	
DATE	**31 AUGUST 2024**