



Course Specification

(Bachelor)

Course Title: **Programmable Logic Devices**

Course Code: **CENX 414**

Program: **B.S. in Computer Engineering**

Department: **Department of Computer Engineering**

College: **College of Computer and Information Sciences**

Institution: **King Saud University**

Version: *Course Specification Version Number*

Last Revision Date: *Pick Revision Date.*

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A. General information about the course:

1. Course Identification

1. Credit hours: (3 (3,1,0) hours)

2. Course type

A. ☐ University ☐ College ☒ Department ☐ Track ☐ Others
B. ☐ Required ☒ Elective

3. Level/year at which this course is offered: (9th or 10th semester, 5th year)

4. Course general Description:

Students get more detailed knowledge in the area of digital circuits design, especially with respect to their implementation into PLDs (FPGAs, CPLDs) and ASICs. Students receive an overview of current technology of these integrated circuits and their off-the-shelf architectures. Students will be able to design and implement a digital system into a PLD using a HDL language.

5. Pre-requirements for this course (if any):

CENX 212, Digital Logic II

6. Co-requirements for this course (if any):

7. Course Main Objective(s):

This course provides detailed knowledge in the area of implementing digital circuits into PLD components such as FPGAs and CPLDs.

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	4 hours per week	100%
2	E-learning		
3	Hybrid - Traditional classroom - E-learning		
4	Distance learning		

3. Contact Hours (based on the academic semester)



No	Activity	Contact Hours
1.	Lectures	45
2.	Laboratory/Studio	
3.	Field	
4.	Tutorial	15
5.	Others (specify)	
Total		60

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	Define and use the behavioral, dataflow and structural styles of writing HDL codes.	1	Lectures and Tutorials	Exams and Homework
1.2	Compare different architectures of PLDs and choose a proper one for a particular application.	1	Lectures and Tutorials	Exams and Homework
2.0	Skills			
2.1	Design and implement a finite state machine (FSM) using a HDL.	2	Lectures and Tutorials	Exams and Homework
2.2	Specify timing requirements for a design and verify that they are met after implementation.	2	Lectures and Tutorials	Exams and Homework
2.3	Develop the necessary skills to function on teams in the context of a group-based course project.	5	Lectures and Tutorials	Project
3.0	Values, autonomy, and responsibility			
3.1	Implement a controller into a PLD, program it and use it in a target application.	6	Lectures and Tutorials	Project

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to digital integrated circuits, history and development of CPLDs and FPGAs.	8
2.	Introduction to HDL modeling and synthesis of Combinational and Sequential logic.	8
3.	Basic architecture of FPGAs and CPLDs: logic cells, programmable interconnect, I/O cells.	12
4.	Timing of digital circuits.	8
5.	FPGA clock domains, and clock management.	8
6.	Memory structures in FPGAs, use of RAM, ROM and FIFO.	8
7.	Advanced FPGA structural features, HARD and SOFT IP cores.	8
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Examination (1)	6	10%
2.	Midterm Examination (2)	12	10%
3.	Homework Assignments	Weekly	10%
4.	Project	15	30%
	Final Exam	End	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	Digital Designing with Programmable Logic Devices, John W. Carter, 1st Edition, Prentice hall.
Supportive References	
Electronic Materials	https://lms.ksu.edu.sa
Other Learning Materials	

2. Required Facilities and equipment

Items	Resources
facilities	Lecture room with number of seats enough to accommodate enrolled students.





Items	Resources
(Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	
Technology equipment (projector, smart board, software)	Overhead projector with required software to facilitate presentations on smart board.
Other equipment (depending on the nature of the specialty)	

F. Assessment of Course Quality

Assessment Areas/Issues	Assessor	Assessment Methods
Effectiveness of teaching	Department Council	Course reports are evaluated by the Department Council.
Effectiveness of Students assessment	Faculty-Peer Review	Final examination is moderated.
Quality of learning resources	Students	Indirect – Edu-gate survey.
The extent to which CLOs have been achieved	Students	Attainment level of every CLO is measured directly.
Other		

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

Assessment Methods (Direct, Indirect)

G. Specification Approval

COUNCIL /COMMITTEE	
REFERENCE NO.	
DATE	

