هيئة تقويم التعليم والتدريب
Education & Training Evaluation Commission

2023
TP-153

Course Specification

(Bachelor)

Course Title:	Computer Architecture
Course Code:	CENX 318
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.*

Table of Contents

A. General information about the course:

1. Course Identification

1. Credit hours: (4 hours)					
2. Course type					
A.	☐University	☐College	☒ Department	☐Track	☐Others
B.	☒ Required		☐Elective		
3. Level/year at which this course is offered: (Level 7)					
4. Course general Description:					
This course introduces embedded system design concepts. Students will investigate the architecture of a selected microcontroller family and learn how to configure and program its core and peripherals. The course includes a lab component to help students get hands-on experience with the theoretical concepts they take in the course.					
5. Pre-requirements for this course (if any)**:**					
CENX 316, Computer Architecture					
6. Co-requirements for this course (if any)**:**					
7. Course Main Objective(s):					
Programming embedded systems using high level language as well configuring different processor modules, such as: reset, oscillator, interrupts, timers, power saving, Analog/Digital and serial communications.					

2. Teaching mode (mark all that apply)

No	Mode of Instruction	Contact Hours	Percentage
1	Traditional classroom	6 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**	30
3.	**Field**	
4.	**Tutorial**	15
5.	**Others (specify)**	
Total		90

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 power saving approaches used in embedded system design and their corresponding tradeoffs such as sleep/idle modes and clock frequency management.	**1**	**Lectures**	**Exams and Homework**
2.0	**Skills**			
2.1	Design the processor interface with I/O devices including memory mapped addressing and buffering.	**2**	**Lab**	**Exams**
2.2	Develop low-level programs that use I/O peripherals such analog-to-digital converters, timers and serial interface.	**2**	**Lectures, Tutorials, Lab**	**Exams and Homework and Lab**
2.3	Design and implement I/O control and data transfers using interrupts	**2**	**Lectures, Tutorials, Lab**	**Exams and Homework and Lab**
3.0	**Values, autonomy, and responsibility**			

Code	Course Learning Outcomes	Code of CLOs aligned with program	Teaching Strategies	Assessment Methods
3.1	Use an integrated development environment (IDE) to write, compile and debug a program (high level or assembly) for a target embedded system.	6	Lectures, Tutorials, Lab	Exams and Homework and Lab

C. Course Content

No	List of Topics	Contact Hours
1.	Introduction to Embedded Systems and PIC24 Processor	2
2.	C Programming for Embedded Systems	5
3.	Oscillator and Configuration Bits	8
4.	Reset and power saving modes	5
5.	Timer Module	5
6.	OC Module	5
7.	Interrupts	6
8.	A/D Module	8
9.	GPIO	6
10.	Serial Memory Interface using SPI	6
11.	LCD Module interface	4
Total		60

D. Students Assessment Activities

No	Assessment Activities *	Assessment timing (in week no)	Percentage of Total Assessment Score
1.	Midterm Examination (1)	6	15%
2.	Midterm Examination (2)	12	15%
3.	Homework Assignments	Weekly	10%
4.	Lab experiment demonstration and report	Bi-weekly	20%
5.	Final Exam (Laboratory + Theory)	End	40% (5+35)%

*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	Microcontrollers: From Assembly Language to C Using the PIC24 Family, Robert B. Reese, J. W. Bruce, and Bryan A. Jones, 2nd edition.
Supportive References	Designing Embedded Systems with PIC Microcontrollers, Principles and Applications (2nd Edition), Tim WilmShurst, 2010.
Electronic Materials	https://lms.ksu.edu.sa
Other Learning Materials	Slides, Lab supplied experiments and Datasheets

2. Required Facilities and equipment

Items	Resources
facilities (Classrooms, laboratories, exhibition rooms, simulation rooms, etc.)	Lecture room with number of seats enough to accommodate enrolled students.
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)	Lab facilities: Laboratory big room, development boards, chip programmer/debugger, logic analyzer, logic probe and voltmeter.

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	