Lahore University of Management Sciences
EE324: Microcontroller and Interfacing

Fall 2023-24

Course Catalog Description

This course deals with the practical concepts related to the use of microcontrollers and embedded controllers in industrial applications. This course provides sufficient knowledge to the students to use microcontrollers to sense real world quantities, analyze the data, and to use the results to perform control functions. This course will provide sufficient foundation for the students to pursue further studies in a number of 'state-of-the-art" areas related to computer design and architecture at the senior (undergraduate) as well as the graduate levels.

Course Details

Credit Hours	2
Core	Core Course for Electrical Engineering
Elective	
Open for Student Category	BSc. students
Closed for Student Category	
Support Services	LUMS offers a range of academic and other services to support students. These are mentioned below, and you are encouraged to use these in addition to in-class assistance from course staff. For a complete list of campus support services available for you click here (https://advising.lums.edu.pk/#supportservices)

Course Prerequisite(s)/Co-Requisite(s)

Pre-requisites: EE220, Basic Programming

Course Offering Details

Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	50 min	Timings and Venue	
Lab (if any) per week	Nbr of Session(s) Per Week	x	Duration			
Tutorial (per week)	Nbr of Tut(s) Per Week	1	Duration	As per requirement		

Instructor	Jahangir Ikram
Room No.	9-217A
Office Hours	TBA
Email	jikram@lums.edu.pk
Telephone	--
Secretary/TA	TBA
TA Office Hours	TBA
Course URL (if any)	LMS

Grading breakup and policy	
Quizzes	20%
Assignments	10%
Midterm	25%
Final	30%
CEP + Viva	15%

Course Learning Outcomes

EE324- The students should be able to:

CLO1: Demonstrate a fundamental knowledge of basic hardware building blocks in an embedded microcomputer system such as microcontrollers, memory, transducers, ADCs and DACs etc.

CLO2: Demonstrate a knowledge of methods, steps, and techniques for interfacing a microcontroller to external world devices such as, motors, sensors, transducers, etc.

Relation to EE Program Outcomes

EE-240 CLOs	Related PLOs	Levels of Learning	Teaching Methods	Assessment Methods
CLO1	PLO3	Cog-2	Instruction, Tutorial, Assignments	Assignments, Quizzes, Midterm, Final
CLO2	PLO3	Cog-3	Instruction, Tutorial, Assignments	Assignments, Quizzes, Midterm, Final

Campus supports & Key university policies

Campus Supports

Students are strongly encouraged to meet course instructors and TA's during office hours for assistance in course-content, understand the course's expectations from enrolled students, etc. Beyond the course, students are also encouraged to use a variety of other resources. (Instructors are also encouraged to refer students to these resources when needed.) These resources include Counseling and Psychological Services/CAPS (for mental health), LUMS Medical Center/LMC (for physical health), Office of Accessibility & Inclusion/ OAI (for long-term disabilities), advising staff dedicated to supporting and guiding students in each school, online resources (https://advising.lums.edu.pk/advising-resources), etc. To view all support services, their specific role as well as contact information click here (https://advising.lums.edu.pk/#supportservices).

Academic Honesty/Plagiarism

LUMS has zero tolerance for academic dishonesty. Students are responsible for upholding academic integrity. If unsure, refer to the student handbook and consult with instructors/teaching assistants. To check for plagiarism before essay submission, use similarity@lums.edu.pk. Consult the following resources: 1) Academic and Intellectual Integrity (http://surl.li/gpvwb), and 2) Understanding and Avoiding Plagiarism (http://surl.li/gpvwo).

LUMS Academic Accommodations/ Petitions policy

Long-term medical conditions are accommodated through the Office of Accessibility & Inclusion (OAI). Short-term emergencies that impact studies are either handled by the course instructor or Student Support Services (SSS). For more information, please see Missed Instrument or 'Petition' FAQs for students and faculty (https://rb.gy/8sj1h)

LUMS Sexual Harassment Policy

LUMS and this class are a harassment-free zone. No behavior that makes someone uncomfortable or negatively impacts the class or individual's potential will be tolerated.

To report sexual harassment experienced or observed in class, please contact me. For further support or to file a complaint, contact OAI at oai@lums.edu.pk or harassment@lums.edu.pk. You may choose to file an informal or formal complaint to put an end to the offending behavior. You can also call their Anti-Harassment helpline at 042-35608877 for advice or concerns. *For more information: Harassment, Bullying & Other Interpersonal Misconduct: Presentation (http://surl.li/gpvwt)*

Module	Topics	Sessions	Readings
1.	Basic hardware building blocks in an embedded microcomputer system	1	class notes
2.	**Microcontroller Interfacing** Review of computer I/O ports and techniques Parallel I/O vs. serial I/O Memory mapped VS independent I/O Theory of interrupts and DMA Quiz 01-TBA	4	TBA
3.	**Microcomputer Peripherals** Timers, PWM	5	
4.	**Serial communication standards** Serial I/O,EIA RS-232 standard , I2C, SPI, USB The Universal Asynchronous Receiver Transmitter Quiz 02-TBA Assignment 01- Due TBA		
		MIDTERM	
5.	**Industrial data acquisition and control** A/D and D/A conversion Quiz 03-TBA	3	
6.	**Interrupts and Interrupt Programming**	2	
7.	**Microcontroller Architecture and Programming**	**4**	
8.	Memory interface and Address decoding techniques Quiz 06- TBA Assignment 02- Due TBA		
9.	**Instruction Set Architecture of PIC**	**2**	
10.	**Assembly Language Programming Techniques** Quiz 07- TBA Assignment 03- Due TBA	**4**	
11.	**Quiz 08- TBA**		
12.	**Transducers, Sensors and actuators** GPS Sensors, Gyroscopes, thermal sensors etc. Quiz 04- TBA	3	

CEP Submission- TBA CEP Viva- TBA

FINAL EXAM

Textbook(s)/Supplementary Readings

Textbook:

PIC Microcontroller and Embedded systems, Mouhammad Ali Mazidi by Prentice Hall Inc.

Examination Detail

Midterm Exam

Yes/No: Yes Duration: 120 minutes

Final Exam

Yes/No: Yes Duration: 180 minutes

Combine /Separate: Combine

Exam Specifications: TBA

Complex Engineering Problem, Problem Based learning OR Open-ended Labs	
Complex Engineering Problem Details	Included: Yes Nature and details of Complex Engineering Problem: Assessment in:
Problem Based learning	Included: N/A Nature and details of Problem Based learning: Assessment in:
Open ended Labs	Included: N/A Nature and details of Open-ended Lab: Assessment in:

Rubric Based Assessment of CLO	
Rubric Details	Rubric used for CLOs: N/A CLO-wise details of each rubric design per assessment module:

Prepared by:	**Dr Jahangir Ikram**
Date:	17.07.2023