Lahore University of Management Sciences

EE324: Microcontroller and Interfacing
Fall 2015-2016

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 the real world quantities, analyses 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	3
Core	Core Course for Electrical Engineering
Elective	
Open for Student Category	BSc. students
Closed for Student Category	

Course Prerequisite(s)/Co-Requisite(s)
Pre-requisites: EE220, Basic Programming Course Co-requisites: None

Course Offering Details						
Lecture(s)	Nbr of Lec(s) Per Week	2	Duration	50 min	Timings and Venue	
Recitation (per week)	Nbr of Rec (s) Per Week	x	Duration			
Lab (if any) per week	Nbr of Session(s) Per Week	x	Duration			
Tutorial (per week)	Nbr of Tut(s) Per Week	x	Duration			

Instructor	Farasat Munir & Jahangir Ikram	
Room No.		
Office Hours		
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Secretary/TA		
TA Office Hours		
Course URL (if any)	LMS	

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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.
	LAB related
CLO3:	Develop an ability to conduct experiments (plan experimental work, construct circuits, connect instruments, operate the instruments, take measurements, as well as analyze and interpret data and report the results.
CLO4:	Use Modern analysis and simulation software.
CLO5:	Design and develop Embedded and Stand-alone systems to devise solutions for the betterment of the society.
CLO6:	Demonstrate the ability to work in a team through a group project involving microprocessor interfacing.
CLO7:	Through Lab based tasks and project develop skills of leadership and project management.
CLO8:	Develop skills of using microcontrollers for solving real life problems off the job and on the job.

Relation to EE Program Outcomes				
EE-240 CLOs	Related PLOs	Levels of Learning	Teaching Methods	Assessment Methods
CLO1	PLO1	Cog-1,2	Instruction, Tutorial, Assignments	Assignments, Quizzes, Midterm, Final
CLO2	PLO3	Cog-1,2,3	Instruction, Tutorial, Assignments	Assignments, Quizzes, Midterm, Final
CLO3	PLO2	Cog-1,2,3,4	Instruction, Tutorial, Assignments	Assignments, Quizzes, Midterm, Final
CLO4	PLO5	Cog-1,2,3,4	Instruction, Tutorial, Assignments	Assignments, Quizzes, Final
CLO5	PLO6	Cog-1,2,3,4	Instruction, Tutorial, Assignments	Assignments, Quizzes, Final
CLO6	PLO9	Cog-1,2,3	Instruction, Tutorial, Assignments	Assignments, Quizzes, Final
CLO7	PLO11			
CLO8	PLO12			

Grading Breakup and Policy	
Lab	15%
Quizzes + Assignments	19+1%
Mid-term Exam	20%
Final Exam	30%
Project	14%
Exhibition	1%

Lahore University of Management Sciences

Module	Topics	Sessions	Readings
1.	Basic hardware building blocks in an embedded microcomputer system	1	class notes
2.	**Microcontroller Architecture and Programming** Microcontroller architecture Memory interface and Address decoding techniques Instruction Set Assembly language programming techniques	**4-6**	
3.	**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	4	TBA
4.	**Microcomputer Peripherals** Timers, PWM Serial data communication standards Serial I/O,EIA RS-232 standard , I2C, SPI, USB The Universal Asynchronous Receiver Transmitter	5	

MIDTERM

Module	Topics	Sessions	Readings
	Industrial data acquisition and control Basic Measurement electronics A/D and D/A conversion	3	
5.	**Transducers, Sensors and actuators** GPS Sensors, Gyroscopes, thermal sensors etc.	3	
6.	**Interrupt Programming Case Studies**	2	
7.	**Case Study: AVR**	2	
8.	Seminars with case studies Seminar Notes	1	

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 Combine Separate: Combine Duration: 90 minutes Preferred Date: TBA Exam Specifications: TBA

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Final Exam	Yes/No: Yes Combine Separate: Combine Duration: 180 minutes Exam Specifications: TBA

Prepared by:	**Farasat Munir**
Date:	**July 9th, 2015**