Philadelphia University

Faculty of Engineering - Department of Mechatronics Engineering

First Semester 2019/2020

Course Details:

Title:	**Microcontroller Systems** (0640328)
Course Type:	Compulsory
Class Time:	11.10 – 12.00 Sunday/Tuesday/Thursday
Prerequisite:	Logical Circuits, Sensors, and Programming
Credit Hours:	Three credit hours (16 weeks per semester, approximately 44 contact hours)
Textbook:	"PIC Microcontrollers: An introduction to microcontrollers" by Martin Bates 2nd edition 2004. Publisher Elsevier / Newnes Looking for a new Book
Course Description:	This course provides the general architecture for microprocessors and microcontrollers, interfacing and programming microcontroller systems, programming and downloading PIC microcontrollers using Assembly and C languages. DC motor control (position and speed). A/D interface. Timing and interrupt.
Website:	www.philadelphia.edu.jo/academics/ttutunji
Instructor:	**Dr. Tarek A. Tutunji** Email: ttutunji@philadelphia.edu.jo Office: Engineering building, Office hours: Sun, Tues, Thurs: 12.00 – 13.00

Course Outlines:

Course Academic Calendar		
Week	**Subject**	**Notes**
Oct 13	**Introduction to Computer Systems**	Chapters 1 & 2
Oct 20	**Microelectronics, Digital Systems, and Microcontrollers**	Chapters 3, 4, and 5
Oct 27	**PIC Application**: H/W Design, Assembly Language	Chapter 6
Nov 3	**PIC Program Development**: Program Design and Analysis	Chapter 7
Nov 10	**PIC 16F84 Architecture**: Block Diagram and Register Sets	Chapter 8
Exam I (Nov 13 -21))		
Nov 17	**PIC Program**: Compile, Debug, Simulate, and Download **PIC Simulation**: MPLAB and Proteus	Ref 1 Chapters 2 and 3
Nov 24	**Programming Techniques**: Timing and Interrupts	Chapter 9
Dec 1	**DC Motor Applications I**: Open-loop control	Chapter 10
Dec 8	**DC Motor Applications II:** Closed loop Control (Position and Speed)	Chapter 13
Dec 15	**PIC Controller Families, Analog-to-Digital Converters** **PIC 16F877 Architecture and Applications**	Chapters 14 & 15 Ref 2, Chapter 3
Exam II (Dec 18-29)		
Dec 22	**C Programming Review**	Ref 2, Chapter 4
Dec 29	**PID Controller Realization using PIC 16F877**	Ref 2, Chapter 10
Jan 5	**Arduino Architecture and Programming**	
Jan 12	**Arduino Architecture and Programming**	
Jan 19	**Review**	
FINAL EXAMS (Jan 25 – Feb 1)		

OPTIONS: Add Raspberry PI basics.

Course Learning Outcomes:

Upon successful completion of this course, the student should be able to:

	Course Learning Outcomes	ABET L.O.	Taxonomy
1.	Know the basics of logical circuits and their interface	1	Knowledge and Understanding
2.	Understand the microprocessor architecture	1	
3.	Understand the PIC microcontroller architecture	1	
4.	Understand programming language basics	1	
5.	Design input-output interface for mechatronic system	2, 6	Thinking and Analysis
6.	Program PIC microcontrollers using Assembly Language	2	
7.	Program Arduino using C Language	2	
8.	Investigate requirements for mechatronic systems	1, 2	Practical and Specific Skills
9.	Design engineering solutions	2, 6	
10.	Communicate with team to solve homework and discuss results with class	3, 5	Communication Skills

Assessment Guidance:

Evaluation of the student performance during the semester (total final mark) will be conducted according to the following activities:

Exams. Two in-class exams will be given. Each will cover about 5-weeks of lectures
Quizzes. Two 10-minute quizzes will be given to the students throughout the semester. These quizzes will cover material discussed during the previous week of lectures. The quizzes will be used as bonus points (added to the exams' grades) to help the students with their grade.
Project. Students will be asked to design and program a system using Proteus simulation (Pic16F84) or Arduino Hardware
Final Exam. The final exam will cover all the class material.

References:

Books

1. Interfacing PIC Microcontroller: Embedded Design by Interactive Simulation by Martin Bates Elsevier 2006
2. Microcontroller Based Applied Digital Control by Dogan Ibrahim. Wiley 2006
3. Beginning Arduino Programming by Brian Evans. Apress 2011
4. 30 Arduino Projects for the Evil Genius by Simon Monk. McGraw Hill 2011

Websites

- http://www.microchip.com/
- http://www.arduino.cc/en/

Grading policy:

First Exam	20%
Second Exam	20%
Project	20%
Final Exam	40%
Total	100%