The University of Jordan
School of Engineering
Department of Computer Engineering
Fall Term – A.Y. 2017-2018

Course:	Embedded Systems Lab – 0907334 (1 Cr. – Core Course)
Catalog Data:	Introduction to embedded systems design tools and hardware programmers. Experiments using both simulation and practical implementation of the basic building blocks of a microcontroller including timers, counters, I/O techniques and requirements, A/D conversion, serial communication. Experiments to explore the system design process using hardware-software co-design process. Design project.
Co-requisites by Course:	Embedded Systems (0907333)
Prerequisites by Topic:	Good background in electronics, circuits, digital logic, and assembly programming.
Textbook:	The lab manual which consists of a set of experiments is posted on the lab website.
References:	• Designing Embedded Systems with PIC Microcontrollers (principles and applications), 2nd Ed. By: Tim Wilmshurst, Newnes, 2007. • An Introduction to the Design of Small-Scale Embedded Systems, 1st Ed. By: Tim Wilmshurst Palgrave, 2001. • Microchip Website: www.microchip.com
Course Website:	**http://embedded-ju.ucoz.com/**
Schedule & Duration:	15 Weeks, 12 labs, 3 hr. each (including exams)
Student Material:	Text book, lab handouts, some instructor keynotes, calculator and access to a personal computer and internet.
College Facilities:	Lab with whiteboard, personal computers, PIC development boards, PIC programmers, oscilliscopes and server.
Course Objectives:	The objectives of this lab are: 1. Introduce students to embedded systems design tools and hardware programmers. 2. Develop students skills in both simulation and practical implementation of the basic building blocks of a microcontroller including timers, counters, I/O techniques and requirements, A/D conversion, serial communication. 3. Improve students communication skills and ability to formulate and slove engineering problems through the complete designing of a medium embedded system with detailed documentation and oral presentation.

Course Outcomes and Relation to ABET Program Outcomes:

Upon successful completion of this course, a student should be able to:
1. Use a set of tools for embedded systems simulation, programming and debugging. [b,k]
2. Implement several embedded systems with particular focus on the interaction between multiple devices.[b]
3. Take part of a multidisciplinary team to design products using microcontrollers and various analog and digital ICs. [b,c,d]
4. Read the datasheet of any embedded system and understand how it works. [b]
5. Develop existing embedded systems by formulating the system design problem including the design constraints, creating a design that satisfies the constraints, implementing the design in hardware and software, and measuring performance against the design constraints. [b,c,d,e]
6. Communicate effectively with lab instructor and labmates through clear documentation and presentation of the designed project. [g]

Lab Schedule:

Date (Week Start)	Event
17/9/2017	Lab Preparations
24/9/2017	Introduction to MPLAB
1/10/2017	MPLAB and Instruction Set Analysis 1
8/10/2017	Instruction Set Analysis 2 & Modular Programming Techniques
15/10/2017	Basic Embedded System Analysis and Design + Introducing Protus **+ Project Announcement**
22/10/2017	Hardware excercises **+ Quiz**
29/10/2017	LCD
5/11/2017	Timers
12/11/2017	**Midterm Exam**
19/11/2017	USART
26/11/2017	A/D
3/12/2017	Using HI-TECH C compiler in MPLAB
10/12/2017	Project Submission & Discussion
Last Week of Study	**Final Exam**

Attendance:

Lab attendance will be taken and the university's polices will be enforced in this regard.

Assessments:

Quizzes, exams, project and in-lab assessment

Grading policy:

Pre-labs & Labsheets   20%
Quiz   10%
Midterm Exam   20%
Project   10%
Final Exam   40%

Instructors:

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Lab Time and Location:

Section 1: Sunday; 1:00 pm— 4:00 pm, Embedded Systems Lab
Section 2: Monday; 9:30 pm— 12:30 pm, Embedded Systems Lab
Section 3: Monday; 12:30 pm— 3:30 pm, Embedded Systems Lab
Section 4: Tuesday; 1:00 pm— 4:00 pm, Embedded Systems Lab
Section 5: Wednesday; 12:30 pm— 3:30 pm, Embedded Systems Lab
Section 6: Thursday; 1:00 pm— 4:00 pm, Embedded Systems Lab

Program Outcomes (PO)

a	An ability to apply knowledge of mathematics, science, and engineering
b	An ability to design and conduct experiment as well as to analyze and interpret data.
c	An ability to design a system, component, or process to meet desired needs , within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
d	An ability to function on multidisplainary team
e	An ability to identify, formulate, and solve engineering problems
f	An understanding of professional and ethical responsibility.
g	An ability to communicate effectively
h	The broad education necessary to understand the impact of engineering solutions in a gloabal, economic, environmental, and societal context
i	A recognition of the need for, and an ability to engage in life-long learning
j	Knowledge of contemporary issues
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

Last Updated: September 17, 2016