The University of Jordan
School of Engineering
Department of Computer Engineering
Fall Term – A.Y. 2019-2020

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, 2nd Ed. By: Tim Wilmshurst Palgrave, 2010. • Microchip Website: www.microchip.com
Course Website:	drsuyyagh.com
Schedule & Duration:	14 Weeks, 10 labs, 3 hr. each (including exams)
Student Material:	Textbook, 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:

- Use a set of tools for embedded systems simulation, programming and debugging. [6]
- Implement several embedded systems with particular focus on the interaction between multiple devices.[6]
- Take part of a multidisciplinary team to design products using microcontrollers and various analog and digital ICs. [2,5,6]
- Read the datasheet of any embedded system and understand how it works. [6]
- 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. [2,6]
- Communicate effectively with lab instructor and lab mates through clear documentation and presentation of the designed project. [3]

Measured outcome in this cycle: 6

Lab Schedule:

Date (Week Start)	Event
9/2/2020	Introduction to MPLAB + MPLAB and Instruction Set Analysis 1
16/2/2020	Instruction Set Analysis 2 & Modular Programming Techniques
23/2/2020	Basic Embedded System Analysis and Design + Hardware exercises
1/3//2020	LCD + **Quiz**
8/3/2020	Embedded C
15/3/2020	**Midterm Exam**
22/3/2020	Timers
29/3/2020	A/D
5/4/2020	USART
12/4/2020	**----- PIC Programming Hours TBD**
19/4/2020	**----- PIC Programming Hours TBD**
26/4/2020	Project Submission & Discussion
7/5/2020	Last Day to drop out from courses
10/5/2020	Last Day of Courses
8/5/2020 – 10/5/2020	**Lab Final Exam during this week**

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	15%
Quiz	5%
Midterm Exam	20%
Project + Report	15% + 5%
Final Exam	40%

Instructors:

Dr. Ashraf Suyyagh dr.suyyagh@gmail.com
Eng. Saadeh Sweadan s.sweadan@ju.edu.jo
Eng. Hanan Al-Yasin (Teaching Assistant) h.alyasin@ju.edu.jo
Eng. Rawan Al-Jamal (Teaching Assistant) r.aljamal@ju.edu.jo

Lab Time and Location:

Embedded Systems Lab
Section 1: Monday; 1:00 pm 4:00 pm; (Eng. Saadeh Sweadan)
Section 2: Wednesday; 1:00 pm— 4:00 pm; (Dr. Ashraf Suyyagh)
Section 4: Sunday; 1:00 pm— 4:00 pm; (Eng. Saadeh Sweadan)
Section 5: Thursday ; 1:00 pm— 4:00 pm; (Dr. Ashraf Suyyagh)

Program Outcomes (PO)

1	an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2	an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3	an ability to communicate effectively with a range of audiences
4	an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5	an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6	an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7	an ability to acquire and apply new knowledge as needed, using appropriate learning strategies

Last Updated: February 7, 2020