



Birzeit University
Faculty of Engineering and Technology
Electrical & Computer Systems Engineering Department
Second Semester 2022/2023

Course Information	
Course Title	Real-Time Systems Laboratory
Course Number	ENCS514
Prerequisites	Real-Time Applications & Embedded Systems (ENCS4330)
Instructors	Dr. Aziz Qaroush, Dr. Hanna Bullata
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Office	IT building second floor <ul style="list-style-type: none"> Office TECH 219 (Dr. Aziz, Dr. Hanna)
Teaching Assistants	Mr. Ibrahim Injass

Text Book	
Title	The experiments text will be provided before the lab sessions. All experiments will be conducted online using simulation tools. Please check the section below that lists the tools to download and install on your machines.
Author	
Publisher	
Year	
Edition	
Book Website	
References	

Software to download	
MPLAB IDE 8.93	The MPLAB IDE helps you write, debug and compile PIC16F877A code. That IDE version is no more supported. However, it is still in use and you can find and download it from various places. download link: https://drive.google.com/drive/u/1/folders/1sHfuTaOHCRp7oNaPglp-3YC3NRXEPWdu
C-compiler	Used to generate machine code for the PIC16F877A chip. We'll try to make it available through the lab TA.
Proteus	This is an application used to simulate the code that has been written under MPLAB. With Proteus software, you can build a complete circuit that includes LEDs, motors, push buttons, LCDs,

potentiometers, and much more. You can also attach an oscilloscope at the output to measure frequencies if needed.

download link:

<https://drive.google.com/drive/u/1/folders/1sHfuTaOHCRp7oNaPglp-3YC3NRXEPWdu>

Check the below link for a video that TA Maher Khdeir prepared on how to download and install MPLAB and Proteus softwares

<https://youtu.be/RhdAwhQ83Ic>

Assessment Type	Weight
TODOs (3 ToDos)	30%
Attendance & Participation	10%
Midterm exam (Hardware part)	30% (after first 5 experiments)
Final exam (Software part)	30% (experiments 6 - 11)

Course Objectives

The aim of this course is to:

- To become familiar with processes and how to create and execute them.
- To study and use many inter process communication techniques (Semaphore, Shared Memory).
- Build client-server applications using socket programming.
- Study and use threads under Linux environment.
- Become familiar with PIC Microcontrollers.
- Become familiar with hardware-oriented software such as Proteus and MPLAB.
- Become familiar with LAB-X1 boards and know how they can be used with other systems.

Teaching & Learning Methods

- Students should become proficient in building multi-process and multi-thread applications. In addition, students will get to know the PIC microcontrollers and learn how to build efficient programs to run on these microcontrollers. Students will be provided with permanent guidance during the lab. It remains that students are responsible for going beyond what they are given in the lab and expand their knowledge. Sharing information among students has proven to be a good way of succeeding collectively. Students are highly encouraged to cooperate. However, they should not mix cooperation with illegal cheating.

Learning Outcomes

Upon successful completion of this lab, students will be able to:

- Learn how to build multi-process and multi-thread applications under Linux OS.
- Learn how to build programs that can run on PIC microcontrollers.

Course Contents		
Week	Topics	
Exp 1	Introduction to PIC Microcontroller	
Exp 2	Embedded Systems: Keypads and DC Motors	
Exp 3	Analog to Digital Conversion and Serial Communication	
Exp 4	Capture, Compare and Pulse Width Modulation (PWM)	
Exp 5	Introduction to Timer0 Module	
	Midterm Exam (Hardware Part)	
Exp 6-7	Process management for real-time applications using FIFOs & Message Queues.	
Exp 8-9	Process management for real-time applications using Semaphore and Shared Memory	
Exp 10	Socket programming and Thread management for real-time applications	
Exp 11	FreeRTOS on Arduino Uno boards	
Exp 12	FPGA – 1 (The experiment title will be announced later on)	

Exp 13	FPGA – 2 (The experiment title will be announced later on)	
	Final Exam (Software Part)	

ميثاق شرف
<p>بموجب التسجيل في هذا المساق يلتزم الطالب باحترام أنظمة وقوانين الجامعة وخاصة تلك المتعلقة بالأمانة العلمية وعدم الغش. ويتحمل الطالب مسئولية ذاتية، أدبية وقانونية، عن المحافظة على الأمانة العلمية وذلك بالامتناع عن الغش في الامتحانات والوظائف والتقارير، وعدم السماح لغيره من الطلاب بأن ينقلوا عنه في الامتحانات والوظائف والتقارير.</p> <p>يستوجب الغش أو محاولة الغش التوبيخ والإجراءات القانونية المنصوص عليها في تعليمات الأمانة الأكاديمية التي أقرها مجلس الجامعة بتاريخ 5 تموز 2006 وتشمل ما يلي:</p> <ol style="list-style-type: none"> 1. العقوبة الأكاديمية: يقررها مدرس المساق وقد تصل إلى علامة رسوب في المساق. 2. العقوبة التأديبية: تقررها لجنة النظام في الكلية وقد تصل إلى الفصل المؤقت أو النهائي من الجامعة. <p>بموجب تسجيلي في هذا المساق واستلامي لهذا الميثاق أعد بشرفي أن أحافظ على الأمانة الأكاديمية بأن أمتنع عن الغش، وأن لا أتسامح مع أي محاولة للغش من قبل الآخرين.</p>
Signature:.....

Additional Notes	
Assignments	Required
Exams	Required
Makeup Exams	No makeup exams
Drop Date	
Attendance	Required to all lab sessions
Workload	
Graded Exam	
Participation	Required
Laboratory	Required
Projects	Required (all projects)
Late Penalties	A late project will not be considered.