

ECE 3411: MICROPROCESSOR APPLICATION LAB

Lecture: Mon/Wed 1:25-2:15, ITEB C30/MONT 421,

Lab: Mon/Wed 3:30-4:20PM, 4:30-5:20PM, ITEB C30/C33

Additional Lab hour: Fri 4-6 P.M. ITEB C30

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Course Description

A microcontroller is one of the major devices in the modern digital world. Beyond the definition of microcontroller, how to use microcontroller, how to design microcontroller-based systems, and what is important knowledge to design microcontroller systems will be discussed. Personal lab activities, take-home exam, and team-based robot programming lab, and quiz will be carried out.

Learning Objectives:**Basic Level Learning Objectives:**

- O1: Students will be able to define terminologies of microcontrollers.
- O2: Students will be able to draw the function blocks of AVR.
- O3: Students will be able to demonstrate the procedure of downloading program to the Xplained mini board using AVR studio program.
- O4: Students will be able to program a simple code using C compiler.

Intermediate Level Learning Objectives:

- O1: Students will be able to combine more than two functions and program using multiple functions for given lab assignments.
- O2: Students will be able to program C compiler using flowchart.
- O3: Students will be able to define hardware interface requirements.
- O4: Students will be able to resolve or debug the programming error.

Ultimate Learning Objectives:

- O1: Students will be able to classify the specifications of microcontroller systems in the real-life applications.

O2: Students will be able to design task-based programming using timer /counter.

O3: Students will be able to construct a flow chart for programmable the conceptual procedures.

Spring 2018 Course Schedule and Student Activities:

wks	Date	Lecture	Lab Practice	Reading Assignment	
				Textbook	Datasheet
1	1/23	Course Outline + Introduction to C-Programming	Soldering, Programming Practice	Ch1-3	
2	1/28	General Purpose Digital Output	Lab#1: LED Blinking, Bit Twiddling Training module#1,2,3	Ch3	Chapter 17
	1/30	General Purpose Digital Input	Lab#2: Button Switch Denouncing Training module#4	Ch6	Chapter 8 Chapter 13
3	2/4	Serial I/O	Lab#3: UART Practice Training module#16,17,18,19,20	Ch5	Chapter 19
	2/6	Analog Digital Conversion (ADC)	Lab#4: ADC Practice Training module#22,23,24,25	Ch7	Chapter 28
4	2/11	Lab Test#1: GPIO, UART Lab Test Location: 001L-C30, 002L-C33			
	2/13	Datasheet Reading#1	Demo Lab Test#1		
5	2/18	LCD Interface and timing	Lab#5: LCD Practice	LCD	Chapter 11
	2/20	Datasheet Reading	Ext Lab: Debug Wire		Chapter 30
6	2/25	Lab Test #2: Lab test#1, ADC, and LCD Test Location: 002L-C30, 001L-C33			
	2/27	Datasheet Reading#2	Demo Lab Test#2	Ch8	
7	3/4	Interrupt	Lab#6: Interrupt Training module#5	Ch8	Chapter 15 Chapter 16
	3/6	Timer/Counter	Lab#7: Timer Practice Training module#7,8	Ch9	Chapter 18
8	3/11	Lab Test#3: Lab test#2, Timer, and Interrupt Test Location: 001L-C30, 002L-C33			
	3/13	Datasheet Reading#3	Demo Lab Test#3		
9	3/18	Spring Recess			
	3/20	Spring Recess			
10	3/25	Pulse-Width Modulation	Lab#8: PWM Practice Training module#9-11	Ch10	
	3/27	SPI	Lab#9: SPI Practice	Ch16	Chapter 23
11	4/1	Lab Test#4: Lab test#3 and PWM Test Location: 002L-C30, 001L-C33			

	4/3	Datasheet Reading#4	Demo Lab Test#4		
12	4/8	Mini Prj Description	001L-Prj#1 002L-Prj#2		
	4/10	Task based programming	Ext Lab: TBP Practice		
13	4/15	Lab Test#5: Lab test#4 and SPI Test Location: 001L-C30, 002L-C33			
	4/17	Datasheet Reading#5	Demo Lab Test#5		
14	4/22	I2C	Lab#10: I2C Practice	Ch17	Chapter 26
	4/24	Datasheet Reading#6	001L-Prj#2 002L-Prj#1		
15	4/29	Lab Test#6: Lab test#5 and I2C Test Location: 002L-C30, 001L-C33			
	5/1	Datasheet Reading#7	Demo Lab Test#6		
16	Project #2 Demo				

Text book

1. Elliot Williams, "Make: AVR Programming: Learning to Write Software for Hardware", Maker Media Inc, 2014.

List of References

2. Steven F. Barrett, and Daniel J. Pack, "Microcontrollers Fundamentals for Engineers and Scientists", Morgan & Claypool Publishers, 2006
3. Steven F. Barret, "Embedded Systems Design with the Atmel AVR Microcontroller Part I, Part II", Morgan & Claypool Publishers, 2010
4. Atmega 328 Datasheet from Atmel Corp Website
5. Useful Link1: <https://scl.uconn.edu/courses/ece3411/index.php>
6. Useful Link2: <http://courses.cit.cornell.edu/ee476/FinalProjects>

Grade (Total score 1000 base):

Class Activity, $5 \times 20 = 100$,
Lab Test, $5 \times 100 = 500$,

Lab Practice, $10 \times 20 = 200$,
Mini-Project, $2 \times 100 = 200$

Lab Test:

We will have 6 times 2-hour long lab test over the course. Among 6 test scores, the best 5 test scores will be counted. Due to the lack of the lab space, lab test will be held in two labs: ITEB C30 and ITEB C33. Students need to do three things: 1) To make codes with respect to the given spec, 2) To demonstrate the performance of the code to Tas, and 3) To upload the code to the Huskyct.

Lab Test Grading:

If students demonstrate the given lab test in the same Monday, they will get full credit. If students didn't complete, then they can finalize it on Tuesday and Wednesday. If students demonstrate on Wednesday, then they will get 50% credit for the test. Every student needs to upload test code as well.

Mini-project#1-“RedBot Racing”:

Two students will form a team. Each team will make a program for the robot and participate in the robot racing competition. Top two teams will get extra 20 points.

Mini-project#2- choose among three projects:

Two students will form a team. Each team will be assigned one of three mini-project topics: 3D joystick, Wifi interface, and Bluetooth interface. Each team need to demonstrate the specific given task from the selected project.

Students with Disabilities

The Center for Students with Disabilities (CSD) at UConn provides accommodations and services for qualified students with disabilities. If you have a documented disability for which you wish to request academic accommodations and have not contacted the CSD, please do so as soon as possible. The CSD is located in Wilbur Cross, Room 204 and can be reached at (860) 486-2020 or at csd@uconn.edu. Detailed information regarding the accommodations process is also available on their website at www.csd.uconn.edu.

In addition, if you need adaptations or accommodations because of a disability (e.g. learning disability, attention deficit disorder, psychological, physical), if you have emergency medical information to share with me, or if you need special arrangements in case the building must be evacuated, please make an appointment with me as soon as possible.

Academic Misconduct Statement

Academic Misconduct in any form is in violation of the University of Connecticut Student Conduct Code and will not be tolerated. This includes but is not limited to: copying or sharing answers on tests or assignments, plagiarism, and having someone else do your academic work. Depending on the act, a student could receive an F grade on test/assignment, F grade for the course, or could be suspended or expelled.

Absence of students: Sec. 10a-50. (Formerly Sec. 10-334g).

Students should inform their instructor about any potential conflicts with scheduled exams or other assignments and a religious holiday that they observe. For conflicts with final examinations, students should, as usual, contact the Office of Student Services and Advocacy (formerly the Dean of Students Office).

Policy Against Discrimination, Harassment and Inappropriate Romantic Relationships

The University is committed to maintaining an environment free of discrimination or discriminatory harassment directed toward any person or group within its community – students, employees, or visitors. Academic and professional excellence can flourish only when each member of our community is assured an atmosphere of mutual respect. All members of the University community are responsible for the maintenance of an academic and work environment in which people are free to learn and work without fear of discrimination or discriminatory harassment. In addition, inappropriate Romantic relationships can undermine the University's mission when those in positions of authority abuse or appear to abuse their authority. To that end, and in accordance with federal and state law, the University prohibits discrimination and discriminatory harassment, as well as inappropriate Romantic relationships, and such behavior will be met with appropriate disciplinary action, up to and including dismissal from the University.

More information is available at <http://policy.uconn.edu/?p=2884>.

Sexual Assault Reporting Policy

To protect the campus community, all non-confidential University employees (including faculty) are required to report assaults they witness or are told about to the Office of Diversity & Equity under the Sexual Assault Response Policy. The University takes all reports with the utmost seriousness. Please be aware that while the information you provide will remain private, it will not be confidential and will be shared with University officials who can help.

More information is available at <http://sexualviolence.uconn.edu/>.