Preliminary Syllabus

ESE280 Embedded Microcontroller Systems Design I

August 11, 2020 3:16 pm

Instructor: Prof. Kenneth Short
(Office hours 6:30 to 8:30 pm. on Tuesdays and Thursdays online via Zoom.)

Disclaimer

This document is a best effort at providing a syllabus for this course. It details how this course is intended to be delivered. Covid-19 may impact these intentions in many unknown ways. So, changes may be inevitable. In spite of this, we will endeavor to provide you with a very positive learning experience.

Objectives

Most electronic systems, ranging from trivial to extremely complex, are designed around an embedded microcontroller or an embedded microprocessor. This course presents the fundamental hardware and software concepts and methodologies used in the design of microcontroller based embedded systems.

Due to Covid-19, this course is being completely redesigned relative to previous offerings as either ESE280 or its predecessor ESE380. Lectures will be synchronous online and laboratories will be in-person.

Target Microcontroller

The target microcontroller is the microcontroller a person uses as the basis for a particular embedded system design. This semester, we will be using a new target microcontroller for this course, the ATmega4809. This microcontroller was chosen for a number of reasons. One reason is because a very simple and inexpensive circuit board, that can be programmed through a USB interface, is available using this microcontroller. This board is called the ATmega4809 Curiosity Nano. You will be provided one of these boards at your first laboratory session.

The primary advantage in using this board is that if, at some point during the semester, the university requires that all laboratories be conducted online, there will still be some possibility of salvaging the laboratory portion of the course. This would require that you conduct the remaining laboratory portion of the course outside of the laboratory facility and without the use of the equipment available to you in the laboratory. This would not be an ideal situation and, hopefully, does not occur.

Textbook

Since the ATmega4809 is a new microcontroller, there are no textbooks that focus on this device. So, there will be no textbook for this course. Instead, the basic concepts of embedded system design and use of the ATmega4809 in particular will be covered in the course lectures and reinforced by the laboratory assignments. This makes it critical that you attend the lectures for success in this course.

Other Reference Materials

There are four primary reference documents used in this course:

1. ATmega4809 Data Sheet
2, Atmel 8-bit AVR Instruction Set
3. AVR Assembler
4. Atmel Studio 7

The first two documents can be found on Blackboard under Documents > ATmega4809 Documents. The other two documents are accessed through the Help tab in Studio 7. Several other useful documents will be made available on Blackboard.

The ATmega4809 Data Sheet is your primary reference document for the microcontroller. This is a data sheet, not a tutorial document. You will be shown how to use it effectively and will eventually become comfortable with its use.

You should also have access to a good introductory digital logic design textbook. Your textbook from ESE 118 should suffice.

Blackboard

You can access class information on-line at: http://blackboard.stonybrook.edu. If you used Blackboard during the Spring semester, your login information (Username and Password) has not changed. If you have never used Stony Brook's Blackboard system, your initial password is your SOLAR ID# and your username is the same as your Stony Brook username, which is generally your first initial and the first 7 letters of your last name.

For problems logging in to Blackboard, go to the helpdesk in the Main Library SINC Site. You can also call: 631-632-9602 or e-mail: helpme@stonybrook.edu.

Lecture

The purpose of the course lectures is to clarify and extend concepts from the reading assignments and to elaborate on concepts required for the laboratory design work. Lectures are held synchronously on-line from 4:45 to 6:05 pm on Tuesdays and Thursdays using Zoom. You can access the Zoom link to the synchronous lectures on Blackboard. To participate in the lecture, you need to have a microphone and webcam. The devices built into your laptop should suffice. For you to be considered as having attended a lecture, your webcam must be on throughout the lecture.

Lectures are presented in a manner that assumes you have completed all assigned reading prior to the lecture. A weekly reading assignment list is provided on Blackboard. Reading assignments are taken primarily from the reference material that is available on Blackboard, Microchip's web site (https://www.microchip.com), or Studio 7's Help files. Copies of the PowerPoint presentations used in the lectures will also be available on Blackboard.

Atmel Studio 7

The software development environment used in this course is Atmel Studio 7. Programs for this course are written in assembly language so that you can gain a clear understanding of the microcontroller's architecture. Studio provides an assembler and simulator for developing and debugging programs for Atmel's AVR family of microcontrollers, including the ATmega4809. You must download and install a copy of this software to your computer from Microchip's web site. A link to the appropriate web page is provided on Blackboard under Documents > ATMEL STUDIO 7.x. Atmel Studio is also available for use in the Embedded Systems Design Laboratory and the ECE CAD Laboratory.

Laboratory

We hope to start laboratory sessions the second week of classes, the week beginning August 30th. During your first assigned laboratory section meeting you will be given an orientation to the operation and procedures of the Embedded Systems Design Laboratory (ESDL) and receive your laboratory computer account. An understanding of the information given in this orientation is critical to your success in the laboratory portion of this course. Please be sure not to miss your first laboratory session and to be there on time.

You must be registered for and attend one of the following three-hour scheduled laboratory sections:

Lab. Sec. 1	Wednesday	8:30 to 11:25 am
Lab. Sec. 2	Wednesday	2:40 to 5:35 pm
Lab. Sec. 3	Thursday	8:00 to 10:55 am
Lab. Sec. 4	Friday	8:30 to 11:25 am
Lab. Sec. 5	Friday	1:00 to 3:50 pm

Laboratory sections meet once a week in the Embedded Systems Design Laboratory (ESDL) in rooms 228 and 230 of the Light Engineering building. **Starting the week beginning August 30th, you must be present in your assigned section at its scheduled starting time.**

Laboratory assignments will be performed individually due to Covid-19 distancing constraints. Your first laboratory session consists of an orientation to the laboratory and its policies and the performance of some simple laboratory tasks. **Attendance during the first laboratory session, as with all laboratory sessions, is mandatory.**

Laboratory assignments are generally provided one week before you must perform them. Except for the first week of laboratory, a portion of your pre-laboratory work must be electronically submitted the day before your assigned laboratory section meets. **Your completed laboratory report must be submitted, to your TA, by the end of your laboratory section. No work is accepted late. Due to staff and equipment limitations, it is not possible for you to make up missed laboratory work.**

Grading

Two exams and a final will be given. Exams cover lecture, laboratory, and reading material. Except for the final, exam dates are tentative. Your course grade will be computed as follows:

Exams	30% total	
	1.	Thursday September 24th,
	2.	Tuesday October 27th, and
Final	20%	Tuesday, December 15th (2:15 to 5:00 pm)
Labs	50%	

Any issues you have regarding the grading of an exam or laboratory must be resolved within one week from the day the graded work is made available for return to you in your laboratory section. **After one week, no grade changes will be made for any reason**!!!

Being Successful in this Course

Your grade is based on your performance in exams and laboratories. A lot of material is covered in the course and much of it is rather detailed. Both hardware and software concepts are initially introduced at a very basic level to accommodate those who are completely new to the material. However, the ramp up in level is significant as the semester progresses.

You need to master concepts in a very short time after they are presented in class. If you have difficulty in understanding any of the course material, get help from the teaching assistants or instructor as soon as possible. You need to apply yourself from the start and continue to apply

yourself throughout the semester. If you wait until later in the semester to get needed assistance, it will most likely be too late.

Provost's Statement

The University Senate Undergraduate and Graduate Councils have authorized that the following required statements appear in all teaching syllabi (graduate and undergraduate courses) on the Stony Brook Campus.

Face/Masks/Coverings
Everyone participating in the laboratory for this class, must wear a mask/face covering at all times. Any student not in compliance with this will be asked to leave the laboratory.

If a student refuses to wear a mask or leave the classroom, the faculty member is asked to report the student's name and the details of the situation to Community Standards.

Americans with Disabilities Act:

If you have a physical, psychological, medical or learning disability that may impact your course work, please contact Disability Support Services, ECC (Educational Communications Center) Building, room128, (631) 632-6748. They will determine with you what accommodations, if any, are necessary and appropriate. All information and documentation is confidential.

Academic Integrity:

Each student must pursue his or her academic goals honestly and be personally accountable for all submitted work. Representing another person's work as your own is always wrong. Faculty are required to report any suspected instances of academic dishonesty to the Academic Judiciary. Faculty in the Health Sciences Center (School of Health Technology & Management, Nursing, Social Welfare, Dental Medicine) and School of Medicine are required to follow their school-specific procedures. For more comprehensive information on academic integrity, including categories of academic dishonesty, please refer to the academic judiciary website at http://www.stonybrook.edu/uaa/academicjudiciary/

Critical Incident Management:

Stony Brook University expects students to respect the rights, privileges, and property of other people. Faculty are required to report to the Office of Judicial Affairs any disruptive behavior that interrupts their ability to teach, compromises the safety of the learning environment, or inhibits students' ability to learn. Faculty in the HSC Schools and the School of Medicine are required to follow their school-specific procedures.

Electronic Communication Statement

Email and especially email sent via Blackboard (http://blackboard.stonybrook.edu) is one of the ways the faculty officially communicates with you for this course. **It is your responsibility to make sure that you read your email in your official University email account.** For most students that is Google Apps for Education (http://www.stonybrook.edu/mycloud), but you may verify your official Electronic Post Office (EPO) address at http://it.stonybrook.edu/help/kb/checking-or-changing-your-mail-forwarding-address-in-the-epo.

If you choose to forward your official University email to another off-campus account, faculty are not responsible for any undeliverable messages to your alternative personal accounts. You can set up Google Mail forwarding using these DoIT-provided instructions found at http://it.stonybrook.edu/help/kb/setting-up-mail-forwarding-in-google-mail.

If you need technical assistance, please contact Client Support at (631) 632-9800 or support-team@stonybrook.edu.