Junior Design Project

ECE 304, Spring 2022 V1

2 credits

Meets: Fridays 2:30 - 3:45 pm Elab2 Room 119

Instructor: David McLaughlin, Ph.D. (he/him pronouns), Professor, ECE Department
211 Marcus Hall; dmclaugh@umass.edu. Office hours to be announced.

Graduate Teaching Assistants:
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Description: This 2-credit course prepares you for ECE Senior Design Project by exposing you to the engineering system design process and giving you practice designing and implementing an embedded sense/response system using programmable 8-bit microcontrollers.

Course Plan: At the beginning of the semester, you will receive a kit containing electronic parts that you will use to design and build an electronic system according to a Project Specification. Working individually, you will develop a set of systems engineering design artifacts and deliverables and complete a series of design and development milestones according to the course schedule. You will do two complete builds of the system. The first build will be based around the Arduino Uno board and Integrated Development Environment (IDE) while the second build will be based on an ATmega328P integrated circuit implemented on a breadboard and programmed in ANSI C.

Lab, Schedule, Support: This course will drive you through a systems engineering design & development process rather than teaching you new fundamental ECE material. This course does not provide the rigid week-to-week schedule and the kind of TA support you typically have in an ECE course. Each of you will undergo your own system design, and each of you will therefore have a unique experience in this course. You will have your own lab kit and you are free to work on your system design and development where and when you see fit, provided you meet the scheduled delivables defined in the semester schedule. We will not have scheduled lab sessions for this course. Rather, Marston 221 will serve as a place you can visit if you want to use a work bench and test equipment, if you need replacement parts, and if you want to get perspective from one of the TAs or UTA's who will be in the lab on a schedule that will be posted to Moodle.

Readings: There is no textbook required for this course. The datasheets for the ATmega328P microcontroller will be useful throughout the second half of the course, and URLs for these resources will be provided. Many open-source resources exist online for students who want help with the Arduino programming part of the course.

Background Knowledge: Prior experience with C programming and the AVR ATmega328P MCU is a pre-requisite for this course. This material is covered in ECE-231, Introduction to Embedded Systems. If you haven't previously taken ECE-231 but are taking that course now, you should enroll in ECE-397A ST-Design Process instead of ECE-304.

Tentative Schedule (subject to change)

JDP Schedule Spring 2022			
	Date	**Class Meeting Topic**	**Due COB**
Week 1	1/28/22	Lecture 1 - Course Intro	
Week 2	2/4/22	Lecture 2 - Project Specifications	collect kit
Week 3	2/11/22	Q&A with the pretend customer	
Week 4	2/18/22	Lecture 3 - Arduino & Sonar Demo	Build1 PDR report due
Week 5	2/25/22	Lecture 4 - Test plans, issues	
Week 6	3/4/22	No Class	Built1 Test plan & EVM1
Week 7	3/11/22	Build1 Report Due, no Class Meeting	Build1 report
	3/18/22	Spring Break	
Week 8	3/25/22	Lecture5 - avr-gcc tools demo	
Week 9	4/1/22	Lecture 6 - Risk Mgt, Q&A with pretend customer	
Week 10	4/8/22	Build2 PDR Due, no Class Meeting	Build2 PDR report due
Week 11	4/15/22	Senior Design Project (SDP) Topics	EVM2
Week 12	4/22/22	Senior Design Project (SDP) Topics	
Week 13	4/29/22	Build2 Report Due, no class meeting	Build2 report

Course Grading:

Item		**% grade**	
Build1 preliminary design review	PDR1	10%	Build1 project specification & block diagram
Test plan 1	TP1	5%	Build1 test & requirement verification plan
Earned value management report 1	EVR1	5%	Earned value management (hours planned & spent) report
Build1 final report	FR1	30%	Video demo of functioning build1 system & requirements verification report
Build2 Preliminary design review	PDR2	10%	Updated project spec, block diagram, test & requirement verification plan. Risk management plan, go-forward schedule
Earned value management report 2	EVR2	5%	Earned value management report
Build2 final report	FR2	35%	Video demo of functioning build2 system; requirements verification report; final EVM chart
	Total	100%	

Accommodation Statement
The University of Massachusetts Amherst is committed to providing an equitable educational opportunity for all students. If you have a documented physical, psychological, or learning disability on file with Disability Services (DS), you may be eligible for reasonable academic accommodations to help you succeed in this course. If you have a documented disability that requires an accommodation, please notify me within the first two weeks of the semester so that we may make appropriate arrangements for you.

Academic Honesty Statement
Since the integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, academic honesty is required of all students at the University of Massachusetts Amherst. Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department head or chair. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent (http://www.umass.edu/dean_students/codeofconduct/acadhonesty/).

Names and Pronouns Statement
Everyone has the right to be addressed by the name and pronouns that they use for themselves. Students can indicate their chosen first name and pronouns on Spire, which appear on class rosters. Please let me know what name and pronouns I should use for you if they are not on the roster. A student's chosen name and pronouns are to be respected at all times in the classroom.

Diversity Statement
The diversity of the participants in this course is a valuable source of ideas, problem solving strategies, and engineering creativity. If you feel that your contribution is not being valued for any reason, please speak with me privately. If you wish to communicate anonymously, you may do so in writing or speak with Dr. Paula Rees, Director of Engineering Diversity Programs (rees@umass.edu, 413-545-6324, Marston 128). We are all members of an academic community where it is our shared responsibility to cultivate a climate where all students/individuals are valued and where both they and their ideas are treated with respect. The College of Engineering Diversity Mission Statement can be found at: https://engineering.umass.edu/about-us/diversity-and-inclusion.

Document History

Revised on	Version	Author	Description
1/24/22	1.0	D. McLaughlin	Initial document creation & release