

**University of Massachusetts Amherst
College of Engineering, Department of Electrical and Computer Engineering**

ECE 231, Introduction to Embedded Systems, Spring 2024

Syllabus

Lead Instructors: Prof. Fatima Anwar (email: fanwar@umass.edu) and Prof. David McLaughlin (email: dmclaugh@umass.edu)

Graduate Teaching Assistants (GTAs): Yasra Chandio (email: ychandio@umass.edu), Momin Ahmad Khan (email: makhan@umass.edu), Khotso Selialia (email: kselialia@umass.edu), Adeel Nasrullah (email: anasrullah@umass.edu)

Undergraduate Teaching Assistants (UTAs): Collin DelSignore (email: cdelsignore@umass.edu), Krisha Adhikari (email: kadhikari@umass.edu), Khushkumar Jahoo (email: Kjajoo@umass.edu), Conor Curtin (email: cpcurtin@umass.edu)

Office hours: TBD

Credits: 4

Lectures: Monday and Wednesday, 2:30 - 3:45 PM, Elab 119

Weekly Lab Schedule: <https://docs.google.com/spreadsheets/d/1aUhHEupBz-UxBLVzG9xqY0pe2em2kSI1-WZNdBOW7Ks/edit?usp=sharing> Marston 221.

Lab Seating: A Google doc will be posted during the first week of classes asking you to select a lab bench in one of the 8 lab sections listed in the weekly lab schedule. You'll use that bench and lab section for the duration of the semester.

Course Description: Embedded systems sense, actuate, compute, and communicate to accomplish tasks in domains such as medical, automotive, and industrial controls. In this course, students will learn the fundamentals of using microcontroller-based embedded systems to solve problems in such domains. By the end of the course, students will be able to choose appropriate hardware based on application requirements, execute and optimize programs on simple microcontrollers, and interface these controllers to other subsystems. These topics will provide a basis for upper-level applied courses, including junior and senior design labs.

Approach: This course will consist of a combination of lectures and lab sessions as well as out-of-class lab activities. Each student will receive a kit containing an 8-bit and 32-bit microcontroller development board along with electronic parts and subsystems for interfacing and building small embedded systems. The first half of the course will focus on 32-bit MCUs using the Beagle Bone Black platform. The second half of the semester will focus on 8-bit

microcontrollers (MCUs) using the Arduino Uno board as a host for the ATmega328P MCU. Each half will have three graded lab assignments for a total of 6 lab assignments. The Piazza platform will be used for communication and sharing information amongst all participants in the course. Kindly sign up at the following link as all announcements will be made through Piazza, <https://piazza.com/umass/spring2024/ece231>

Lectures: Attendance at all lectures is strongly encouraged as key information, examples, and other course material are covered. Lecture slides will be posted to Moodle prior to class and ECHO360 recordings will be made available in the event you miss a class. Students should bring their laptops to class to follow-along with the notes, since numerous examples of code will be presented during lectures.

Labs: Two hour labs guided by a course teaching assistant will be held weekly. A lab session sign-up form will be posted to Moodle during the first week of classes allowing you to select the lab session you will attend for the duration of the course. The policy of this course is that each student is to work individually on labs and lab reports. This ensures that everyone learns the material. Lab reports and/or videos must be uploaded to Moodle by specified due dates.

Late or missed work: Late labs will be subject to a 25% per day late penalty. Missed labs and exams will be excused for only documented reasons such as illness or other extenuating circumstance.

Grading:

Labs 1-6:	60%
Midterm:	20%
Final:	20%

Required Textbooks:

- M. Mazidi, S. Naimi, and S. Naimi, The AVR Microcontroller and Embedded Systems Using Assembly and C, 2nd Edition, 2017. Available in paperback (\$25) and Kindle (\$15.50) editions from Amazon.
- D. Molloy, Exploring BeagleBone: Tools and Techniques for Building with Embedded Linux, 2nd Edition. Available in paperback (\$22.87-\$35.72) and Kindle (\$24.00) editions from Amazon. Also available at no charge on the O'Reilly Safari Learning Platform.

Course Policies and Statements:

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 the lead instructors within the first two weeks of the semester so that we may make appropriate arrangements for you.

Academic Honesty Statement

It is the policy of this course that everyone works individually on all labs, lab reports, and exams. Sharing of computer code is not allowed. 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 us 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>.