ECE 251 Course Syllabus: Fall 2025
Introduction to Microcontrollers and IoT

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Class Lectures: Tue and Thu 8 – 9:15 PM	Wagar 231
Lab – L04: Mon 9 – 11:150 AM	Engr C105
Lab – L06: Tue 9:30 AM – 12:20 PM	Engr C107
Lab – L02: Tue 2 – 4:50 PM	Engr C107
Lab – L03: Fri 8 - 10:50 AM	Engr C107
Final Exam: Wed December 17, 2 - 4PM	Wagar 231

Required Text: **Embedded Systems with ARM Cortex-M3 Microcontrollers in Assembly Language and C**, Dr. Yifeng Zhu, Third or Fourth Edition preferred; all editions are acceptable.

Course Description: Microprocessor organization, assembly language, C language, I/O techniques, real-time interfaces, applications, hardware and software.

Prerequisites: ECE102 (Digital Circuit Logic)

Grading:
The following is the grading breakdown for each major component:

- Midterm Exam 15%
- Final Exam 25%
- Labs & Practical 35% (20% Practical, 80% Labs)
- Online Exercises 15%
- Lab Attendance 5%
- Class Participation 5%

Grading Scale:
While lower cutoffs may be used, the following grade cut-offs are guaranteed:

A	A-	B+	B	B-	C+	C	D
93	90	87	83	80	77	70	60

Online Exercises: Online exercises will be given weekly on Canvas except for the week of the Midterm exam. They are used to help reinforce knowledge gained during lectures. They will be due at midnight on Sunday with no exceptions. You must finish the exercise within four hours of starting it.

Labs: There will be a series of 8 to 9 labs. They will vary from one to two weeks long each. There will be one lab practical exam during the course that will be held during your respective lab period. This practical will focus on your programming skills. Lab reports are due on Canvas on the second Monday *after* the corresponding lab session. Late submissions can be turned in up to 21 days late (unless the final deadline near the end of the semester supersedes this) with a penalty of 25% the first week (i.e. between 0-6 days late), 50% the second week and 75% the third week. After 21 days late, the submission will receive a 0. For example, the maximum score for two days late is 75% while the maximum score for 10 days late is 50% and for > 21 days late is 0%.

Many students struggle with assembly language programming. The labs are the best way to learn this material. It is critically important to complete all labs. Failure to do so will strongly impact your overall grade. **Please come talk to me or the TAs before you get behind**.

Lab Practical: There will be a lab practical. This is an exam taken during a scheduled lab period to demonstrate your ability to create and run a program in C and in assembly language. **This is an exam** and you are not to give or receive help on these problems. You must use the lab systems provided. You may not use cell phones or other computing resources (laptop, tablet, etc.). You must be able to explain the operation of the code you are submitting. If we believe you have received aid then you will receive a 0 score.

Collaboration: You are expected to work on all exercise problems and labs yourself, but ***reasonable*** collaboration is allowed and encouraged. **Copying problem solutions or software from another student is not allowed and, at a minimum, will result in a 0 score**. Students will be expected to explain the operation of code they turn in. No collaboration is allowed on any exam or practical.

Attendance in class is expected. If you are unable to attend class, it is your responsibility to obtain class notes or other information. I will use iClicker Cloud in class to determine your class participation score.

Academic Integrity:
This course will adhere to the CSU Academic Integrity Policy as found in the General Catalog (http://www.conflictresolution.colostate.edu/academic-integrity) and the Student Conduct Code (http://www.conflictresolution.colostate.edu/conduct-code). At a minimum, violations will result in a grading penalty in this course and a report to the Office of Conflict Resolution and Student Conduct Services.

All submitted work should be your own. Copying of language, structure, images, ideas, or thoughts of another, and representing them as one's own without proper acknowledgement (from web sites, books, papers, other students, solutions from previous offerings of this course, etc.) and failure to cite sources properly is not acceptable. Sources must always be appropriately referenced, whether the source is printed, electronic, or spoken. **My policy is that of zero tolerance**. Minor first infractions can lead to a zero score and/or up to to one letter level (e.g. A to B) reduction in the course grade. Major repeated infractions will result in "F" grade for the course as well as reporting to the Student Resolution Center.

ECE 251 Course Outline

- **Microprocessor Overview**
  - Representation of Integers
  - Memory
  - Major Components of a Microcontroller
  - ARM Cortex Microcontroller
- **C Programming Language**
  - Variables and Operators
  - Functions
  - Pointers, Arrays and Strings
  - Structures and Typedef
  - Recursion
- **ARM Cortex Assembly Language Programming**
  - ARM Cortex Instruction Set:
  - Register Model & Addressing Modes
  - Data transfer and manipulation instructions
  - Arithmetic Instructions
  - Logical and Bit Operations
  - Branch Instructions
- **Advanced Assembly Programming**
  - Loops
  - Stack and Stack Pointer
  - Subroutines and Parameter Passing
  - Fixed-Point and Floating-Point Numbers
- **ARM I/O**
  - Parallel I/O
  - Exceptions: Resets and Interrupts
  - SysTick Real Time Clock
  - ARM Cortex Serial I/O (SSI, I2C, UART)
  - Analog to Digital Converter
  - Pulse-width Modulation
- **Other Microcontroller Architectures**
- **FINAL EXAM** Wednesday, December 17, 2025, 2 – 4 PM in Wagar 231

Important information for students:

Masks are no longer required inside university buildings. You must, however, meet university vaccine or exemption requirements.

All students are expected and required to report to the COVID Reporter (https://covid.colostate.edu/reporter/) **when:**

- You suspect you have symptoms of COVID, regardless of whether or not you are vaccinated and even if your symptoms are mild
- You have tested positive for COVID through a non-CSU testing site, such as home test or test at a pharmacy
- You believe you may have been exposed to COVID go to the COVID Reporter and follow the guidance under "I believe I have been in close contact with someone who has COVID-19." This guidance will depend upon your individual circumstances

You will not be penalized in any way for reporting symptoms or concerns.

Do not ask me as your instructor to report for you. It is your responsibility to report through the COVID Reporter promptly.

As your instructor I may not ask you about vaccination status or if you have COVID but you may freely volunteer to send me information from a public health official - if you have been asked to isolate or quarantine.

When you complete the COVID Reporter, the CSU Public Health office is notified. Once notified, that office will contact you and, depending upon each situation, will conduct contact tracing, initiate any necessary public health requirements and notify you if you need to take any steps.

If you do not have internet access to fill out the online COVID-19 Reporter, please call (970) 491-4600.

For the latest information about the University's COVID resources and information, including FAQs about the spring semester, please visit the **CSU COVID-19 site** https://covid.colostate.edu/.

CSU Has Resources to Help

Many of us are struggling. CSU is a community that cares. You are not alone. CSU Health Network Counseling Services has trained professionals who can help. Your student fees provide access to a wide range of support services. Call Counseling Services at (970) 491-6053, and they will work together with you to find out which services are right for you. Visit https://health.colostate.edu/about-counseling-services to learn more and https://health.colostate.edu/mental-health-resources/ for additional student mental health and well-being resources. If you are concerned about a friend or peer, use Tell Someone by calling (970) 491-1350 or visiting https://supportandsafety.colostate.edu/tell-someone/ to share your concerns with a professional who can discreetly connect the distressed individual with the proper resources. Rams Take Care of Rams. Reach out and ask for help if you or someone you know if having a difficult time.