ELEC 424/ COMP 424 / ELEC 553

Mobile & Embedded Systems

Fall 2023 Syllabus

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Hours
Lecture: 4:00-5:15pm Mon in BRK 101, Wed in HRZ 212
Office Hours: Tues 3:00-4:00pm in Duncan Hall 2098 or by appointment

Course Page
Everything will be posted to Canvas here.

Course Topics

- Linux
  - Kernel
  - Drivers
  - Boot
- Raspberry Pi/BeagleBoard
- Computer architecture
  - ARM
  - RISC-V
  - Compilers/cross-compilation
- Autonomous vehicles (case study)
  - CAN bus
  - PID control

    - Mobile computer vision (OpenCV)

Learning Objectives

By the end of the course, students should be able to:

- Understand the general workings of Linux
- Write a device driver
- Modify the kernel
- Use OpenCV
- Send messages across the CAN bus
- Build a (somewhat-capable) autonomous system

Text (None Required)

Derek Molloy, *Exploring BeagleBone: Tools and Techniques for Building with Embedded Linux*, 2nd Edition. (Amazon)

- Useful for working with Linux and devices on a BeagleBoard

Robert Love, *Linux Kernel Development*, 3rd Edition. (Amazon)

- Deep dive on the Linux kernel

Jonathan Corbet, Alessandro Rubini, & Greg Kroah-Hartman, *Linux Device Drivers*, 3rd Edition. (Link)

- Deep dive on Linux drivers

Materials (Required)

Parts (<$100 excluding tax and shipping) must be purchased for the course in order to do the projects. Details on what to buy will be announced in class and via Canvas.

Prerequisites

This course assumes knowledge of computer engineering and programming at the level of ELEC 220. This includes basic experience with C.

Contact me if you have any concerns about not meeting the prerequisites. I really want everyone who is interested to be able to participate in the class.

Grading

Projects	45%
Assignments	30%
Exam(s)	15%
In-Class Exercises	10%

There will be a group final project (counted towards the Projects portion of the grade). By default group project/assignment grades will be shared equally by all members. However, if it is determined that students are failing to contribute to such works then significant grade reductions can occur. The graduate section of this course will require students to perform a more challenging version of the final project and some projects and assignments may also have extra requirements for students in the graduate section. The final project will count as two projects.

Grades will be given as follows (without rounding):

A	100 %	to 94.0%
A-	< 94.0 %	to 90.0%
B+	< 90.0 %	to 87.0%
B	< 87.0 %	to 84.0%
B-	< 84.0 %	to 80.0%
C+	< 80.0 %	to 77.0%
C	< 77.0 %	to 74.0%
C-	< 74.0 %	to 70.0%
D+	< 70.0 %	to 67.0%
D	< 67.0 %	to 64.0%
D-	< 64.0 %	to 61.0%
F	< 61.0 %	to 0.0%

Attendance & In-Class Exercises

Attendance of the lectures is expected. In-class exercises counting towards final grades will be given during at least some of the lectures.

Late Policy

Every assignment (100 points total) can be submitted up to 24 hours late with a -50 point deduction effective after the deadline.

Honor System

Unless stated otherwise, assignments will be individually graded. Collaboration on assignments is encouraged, but the work you submit should be your own. Do not just copy others' homework, and don't submit any work you don't understand. For work involving groups, partners should contribute equally to the work. It's OK to divide the work among group members but each student should be able to answer any questions about the work including any writeups. Groups should not copy each other's work except in cases specifically allowed by the instructor. Using unauthorized aid or misrepresenting one's work is a Rice Honor Code violation.

Online Course Material

For course material that I generate, students may use the material for any course-related purpose. However, I ask students not to remove any copyright notices if they forward or otherwise re-use the material. (Any copyright notices are included to preserve my rights in the event that material is included in some future publication.)

Special Requirements

If you have a documented disability that may affect academic performance, you should: 1) make sure this documentation is on file with Disability Resource Center (Allen Center, Room 111 / adarice@rice.edu / x5841) to determine the accommodations you need; and 2) meet with the instructor(s) to discuss your accommodation needs.

Syllabus Modifications

Information contained in this syllabus may be subject to change with reasonable advance notice as deemed appropriate by the instructor.