ECE598: Advanced Operating Systems
University of Maine — Spring 2018

Instructor:

    Vincent Weaver, vincent.weaver@maine.edu

    Office Hours: Barrows 203, 12:00pm - 1:00pm Tues/Thurs (or e-mail for appointment)

Lectures: Barrows 131, Tuesday/Thursday 2:00pm-3:15pm

Course Website: `http://web.eece.maine.edu/~vweaver/classes/ece598_2018s/`

Course Summary:

We will investigate at a low level the features of a modern operating system: virtual memory, filesystems, scheduling, device drivers, and multi-tasking. We will also write a simple operating system from scratch that will run on a Raspberry Pi.

Pre-requisites:

ECE471 or ECE477 or permission of instructor (The main requirement is C and ARM assembly).

Required Textbooks: None

Optional Textbooks:

- *Modern Operating Systems* by A.S. Tanenbaum.
- *Understanding the Linux Kernel* by Bovet and Cesati.
- *UNIX Systems for Modern Architecture* by Schimmel

Hardware:

We will be using a Raspberry Pi Model 2 or 3 for the homeworks. Model A, B, A+, B+, and Zero are *not* recommended.
At a minimum you will need a Pi, a memory card, a USB-micro cable, and a USB-serial adapter.

After this class you will be able to:

1. Define the characteristics of an Operating System
2. Know how to program Raspberry Pi Hardware at a low-level
3. Know what a bootloader is and how it works
4. Know what constitutes a compiler, assembler, and linker
5. Understand and be able to write device drivers
6. Know about simple console input and output, including serial UARTs and Graphics / Framebuffer
7. Know how Virtual Memory works
8. Understand what filesystems are for (fat32, ext4, brtfs, journaling)
9. Understand how to implement a multi-tasking OS
10. Understand how Job Scheduling works
11. Understand the challenges of Operating Systems on multi-core machines
12. Explore computer security issues found on modern processors.

Grading:

Class Participation (5%)
11 homework assignments (50% total), the lowest grade will be dropped
The homeworks will encompass the low-level coding of the custom operating system.
2 midterm exams (25% total)
1 final project (20%)

Late Work: Late work is penalized at 20% a day.

University of Maine required Statements

Academic Honesty Statement

Academic honesty is very important. It is dishonest to cheat on exams, to copy term papers, to submit papers written by another person, to fake experimental results, or to copy or reword parts of books or articles into your own papers without appropriately citing the source. Students committing or aiding in any of these violations may be given failing grades for an assignment or for an entire course, at the discretion of the instructor. In addition to any academic action taken by an instructor, these violations are also subject to action under the University of Maine Student Conduct Code. The maximum possible sanction under the student conduct code is dismissal from the University.

Students with disabilities statement

If you have a disability for which you may be requesting an accommodation, please contact Student Accessibility Services, 121 East Annex, 581-2319, as early as possible in the term. Students who have already been approved for accommodations by SAS and have a current accommodation letter should meet with me (the instructor of the course) privately as soon as possible.

Course Schedule Disclaimer (Disruption Clause)

In the event of an extended disruption of normal classroom activities, the format for this course may be modified to enable its completion within its programmed time frame. In that event, you will be provided an addendum to the syllabus that will supersede this version.

Sexual Violence Policy and Sexual Discrimination Reporting

The University of Maine is committed to making campus a safe place for students. Because of this commitment, if you tell a teacher about an experience of sexual assault, sexual harassment, stalking, relationship abuse (dating violence and domestic violence), sexual misconduct or any form of gender discrimination involving members of the campus, your teacher is required to report this information to the campus Office of Sexual Assault & Violence Prevention or the Office of Equal Opportunity.

If you want to talk in confidence to someone about an experience of sexual discrimination, please contact these resources:

- For confidential resources on campus: Counseling Center: 207-581-1392 or Cutler Health Center: at 207-581-4000.

- For confidential resources off campus: Rape Response Services: 1-800-310-0000 or Spruce Run: 1-800-863-9909.

- Other resources: The resources listed below can offer support but may have to report the incident to others who can help: For support services on campus: Office of Sexual Assault & Violence Prevention: 207-581-1406, Office of Community Standards: 207-581-1409, University of Maine Police: 207-581-4040 or 911.

Or see the OSAVP website for a complete list of services at `http://www.umaine.edu/osavp/`