CIS 415
Operating Systems
Welcome

Prof. Allen D. Malony

Department of Computer and Information Science

Spring 2020

UNIVERSITY OF OREGON

Logistics

❑ Course is being taught online

❑ Lectures will be done using Zoom meetings
  ○ Slides will be posted on the CIS 415 website in advance
  ○ Zoom meetings will be recorded and also posted

❑ Please mute your microphones

❑ If you need to ask a question, there is a way to raise your hand on the "Participants" sub-window
  ○ I will stop periodically to check

Objectives

❑ Course Outline

  ○ Logistics

  ○ What is CIS 415?

  ○ What is expected of you?

  ○ What will you learn in CIS 415?

❑ Schedule

❑ Discussion / Lab

❑ Expectations

Course Logistics

❑ Lecture time
  - ○ CRN #31656
  - ○ Tuesday/Thursday: 14:00-15:20, online
  - ○ ~60 students enrolled

❑ Exams schedule
  - ○ Midterm: May 5, 14:00-15:20, online
  - ○ Final: June 11, 12:30-14:30, online

❑ Undergraduate course prerequisite
  - ○ CIS 313, CIS 314, CIS 330 (C/C++ and Unix)

❑ Discussion / Lab
  - ○ CRN #31657: Friday, 10:00-10:50, online
  - ○ CRN #31658: Friday, 12:00-12:50, online
 - ○ CRN #31659: Friday, 13:00-13:50, online

Who's involved?

❑ Instructor
- ○ Allen D. Malony (malony@cs.uoregon.edu)
  - ◆ parallel computing, performance analysis
  - ◆ computational/data science
- ○ Office hours
  - ◆ Monday, 13:00-14:00, 300 Deschutes Hall (virtually)
  - ◆ Wednesday, 14:00-15:00, 300 Deschutes Hall (virtually)
  - ◆ By appointment

❑ Teaching assistants
- ○ Jared Hall (jhall1@cs.uoregon.edu)
  - ◆ see course web page for office hours
- ○ Grayson Guan (gguan@cs.uoregon.edu)
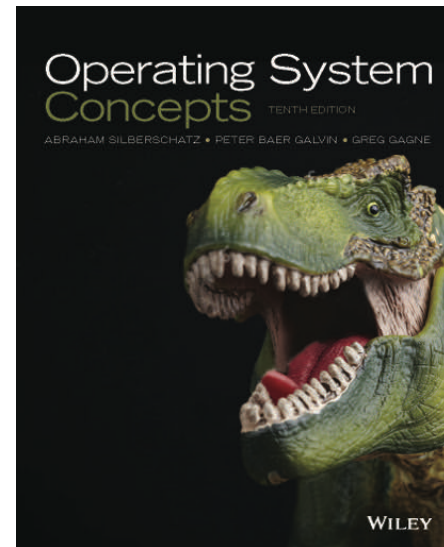 - ◆ see course web page for office hours
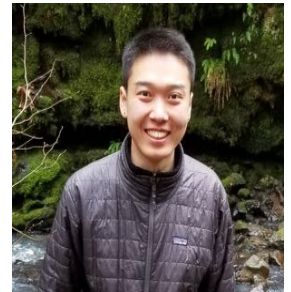
Book Resources

❑ Required

"Operating Systems Concepts,"
A. Silberschatz, P. Baer Galvin, G. Gagne,
Tenth Edition, John Wiley & Sons, Inc.,
ISBN: 978-1-118-06333-0, 2018.

  o Very new edition (much updated from 9th)

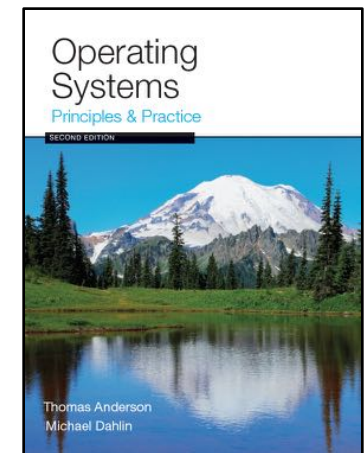 o Used in Spring 2019 and Fall 2019

http://www.os-book.com

❑ Reference

"Operating Systems: Principles & Practice,"
Thomas Anderson and Michael Dahlin,
Second Edition, Recursive Books,
ISBN: 978-0-9856735-2-9, 2014.

  o Used in Fall 2015

Online Resources

❑ CIS 415 web page:

http://www.cs.uoregon.edu/classes/20S/cis415

❑ Canvas

 ○ Most course materials on Canvas

 ○ Login to canvas.uoregon.edu

 ○ Select "CIS 415" from the "Courses" pulldown menu

 ○ Direct link:

  https://canvas.uoregon.edu/courses/155487

Course Structure

- ❑ Lectures (Prof. Malony)
  - ○ Focus on core OS concepts
  - ○ Quizzes and exams
- ❑ Lab sessions (Jared Hall, Grayson Guan)
  - ○ Present material needed for programming assignments
    - ◆ C and Unix, processes/threads, system calls, signals, and so on
  - ○ Provide programming assignment assistance
  - ○ Provide tutorials and practice sessions
- ❑ Grading
  - ○ 5% lab attendance and participation (important!)
  - ○ 20% midterm (May 5, 14:00-15:20, online)
  - ○ 40% final exam (June 11, 12:30-14:30, online)
  - ○ 35% programming projects (3 projects, individual)

More on Grading

❑ All graded components are to be done individually

❑ The midterm and final exams are during lecture

- ○ Take place in a secure testing environment
- ○ Best for individual assessment
- ○ Represents 60% of total grade

❑ Programming assignments are also done by yourself

- ○ Take place outside of lecture and lab
- ○ Represent 35% of total grade

❑ A student must pass the final exam to pass the course

- ○ Successful completion of programming assignments alone will not be sufficient to pass the CIS 415 course

Course Plan

- ❑ Topics covered (roughly 17 lectures, follows OSC book)
  - ○ Introduction, OS structure, and system calls (2 lectures)
  - ○ Processes, IPC, and RPC (2 lectures)
  - ○ Threads and CPU scheduling (2 lectures)
  - ○ Synchronization and concurrency (3 lectures)
  - ○ Memory management and virtual memory (3 lectures)
  - ○ I/O systems, storage and file systems (2 lectures)
  - ○ Virtual machines (1 lecture)
  - ○ Protection (1 week)
- ❑ Schedule lists all relevant readings, assignments, test dates
  - ○ Links to online papers assigned for course readings
  - ○ Supplements to OSC book
  - ○ All slides will be available in advance of lecture on Canvas
- ❑ Check Canvas and website for announcements and updates

Lectures

❑ OSC book and online materials are you main sources for broader/deeper OS information

❑ Lectures will stay close to OSC book content
  - ❍ Covers fundamental topics of more importance
  - ❍ Cannot cover everything in a single quarter
  - ❍ Other materials will be provided for certain topics

❑ Lectures will complement programming component with respect to overall ideas, but the online materials will be more useful for implementation

❑ All lectures will be given online

Discussion / Programming Labs

❑ Required 50-minute meeting each week

  ○ Students enrolled in 1 of 3 sessions

  ○ It is ok to go to other sessions

  ○ All labs will be given online

❑ Objective

  ○ Instruction on OS programming topics and methods

  ○ Help prepare students for programming projects

❑ Student responsibility

  ○ 5% of grade will be for lab attendance and successful completion of programming lab exercises

What is expected of you?

- ❑ Background
  - ○ CIS 314 – computer organization and architecture
  - ○ CIS 313 – data structures and algorithms
  - ○ CIS 330 – C/C++ and Unix programming
- ❑ Engagement with course in a responsible manner
  - ○ Attend lectures and labs
  - ○ Do the recommended reading
  - ○ Submit projects on time (no late submission accepted)
  - ○ Take advantage of office hours
  - ○ Read handout materials before turning to Piazza
- ❑ Dedication to the art of finding answers yourself through source materials, online documentation, books, and internet!!!
- ❑ Persistence
  - ○ There is a lot of work in the course
  - ○ It is very important to stay on top of it!

What will you get out of CIS 415?

❑ My goals
  ○ Provide you with the knowledge to understand the fundamentals of modern operating systems
  ○ Provide you with in-depth practical experience in working with (Linux) OS and systems programming tools

❑ Your goals
  ○ Commit to a challenging course
  ○ Keep a sustained effort throughout the quarter
  ○ Failure to keep up (readings, assignment) will reduce learning

❑ Pay-off for you
  ○ OS knowledge is fundamental to practically everything!
  ○ Systems programming skills are highly marketable!

❑ You will get out of CIS 415 what you put into CIS 415!

Course Projects

❑ Best way to understand the material is by doing
❑ Focus on programming in a Linux environment and understanding systems issues
❑ All projects are to be done individually
❑ General learning targets
  ○ Project 1: C structures and string processing
  ○ Project 2: Resource scheduling and process control
  ○ Project 3: Threading, concurrency, and IPC
❑ Learning targets (example):
  ○ Build a shell environment
  ○ Create a job scheduler using process control in Linux
  ○ Develop a publish/subscribe systems using IPC and resource management services

Development Environment for Projects

❑ A 64-bit and 32-bit Linux Mint (MATE) image is provided for use with Oracle's VirtualBox (https://www.virtualbox.org)

   ❍ See Assignment 1!

❑ Whatever environment you use to develop and test your programs is your choice

❑ HOWEVER, your submissions will be graded on a 64-bit Linux Mint (MATE) system running VirtualBox

   ❍ It is imperative that you test your code in the Linux Mint (MATE) environment before you submit

   ❍ Things that work perfectly in any other environment will undoubtedly fail in the Linux Mint (MATE) VM

❑ If you do not or can not install and run VirtualBox on your personal system, let us know and we will figure out a way to provide it on a CIS machine

Course Schedule

- ❑ CIS 415 web site has a "Logistics" link which will take you to a page with the course schedule
- ❑ It shows lectures and gives links to slides
  - ❍ Lecture slides will be upload before lecture takes place
- ❑ It shows what readings you should start and complete by the next lecture, with links to online documents beyond the book
- ❑ It shows assignments and due dates
- ❑ There may be changes to the schedule
  - ❍ These will be announced via Canvas
  - ❍ Students are responsible to check schedule for changes

New Reality of COVID-19

❑ All UO courses are online

❑ All lectures and labs will be online
  ○ All will be using Zoom

❑ Prof. Malony's Zoom lectures will be linked on the CIS 415 schedule and on the "Zoom" webpage
  ○ Recordings of video, audio, and chat will be available

❑ Zoom labs will be linked on the CIS 415 schedule and on the "Zoom" webpage
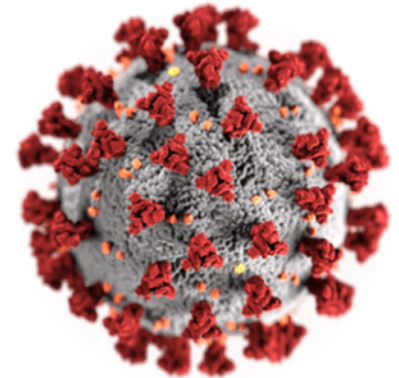
Acknowledgements

❑ This CIS 415 course was are created with content taken from several sources with permission

❑ Particular contributions acknowledge are:

○ UO colleagues who have taught CIS 415 before have provided excellent lecture material and structure for programming projects

○ Our OSC book provides instructor materials and slides

Academic Misconduct

❑ Students must follow university guidelines on academic conduct
❑ University of Oregon's Student Conduct Code
  ❍ Information on student academic misconduct
  ❍ Rules for cheating and penalties
    http://policies.uoregon.edu/vol-3-administration-student-affairs/ch-1-conduct/student-conduct-code
❑ Programming projects are individual efforts
  ❍ Discussing with classmates is encourage for learning
  ❍ Sharing your code with classmates is prohibited
  ❍ Plagiarizing code is prohibited
❑ Collusion or plagiarism
  ❍ Definition: use of "identical" source
  ❍ If caught, all individuals involved will receive an "F" in the course
❑ Rent-a-coder
  ❍ Individual using will receive an "F" in the course
  ❍ Recommend to UO Academic Affairs for expulsion
❑ We have a variety of tools to catch violations