

CSC 420 Spring 2024 Syllabus

Operating Systems (CSC 420) Spring 2024

Marcus Birkenkrahe

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1 General Course Information

- Meeting Times: Tuesday/Thursday, 09:30-10:45 hrs
- Meeting place: Lyon building computer lab 104
- Professor: Marcus Birkenkrahe
- Office: Derby Science Building 210
- Phone: (870) 307-7254 (office) / (501 422-4725 (private)
- Office hours: Mon/Wed/Fri 10-10:50 am & 3-3.50 pm, Tue/Thu
- The following textbooks were used to prepare this course:
 1. The Linux Command Line (2e) by Shotts, NoStarch, 2019.
 2. Operating Systems Concepts (10e) by Silberschatz et al, Wiley, 2018.
 3. Operating Systems Foundations with Linux on the Raspberry Pi byVanderbauwhede/Singer. ARM Education Media, 2019.
 4. How Linux Works (3e) by Ward. NoStarch, 2021.
 5. Wicked Cool Shell Scripts (2e) by Taylor/Perry. NoStarch 2016.

2 Standard and course policies

Standard Lyon College Policies are incorporated into this syllabus and can be found at: lyon.edu/standard-course-policies.

The **Assignments and Honor Code** and the **Attendance Policy** are incorporated into this syllabus also and can be found at: tinyurl.com/LyonPolicy.

3 Objectives

Operating systems manage a computer's resources for its users and their applications. We focus on the underlying concepts, look at examples and try them out - my preferred sandbox being Linux, which you will be introduced to, including process management and simple shell programming. We also address concurrency and parallelization, cloud computing, memory, and storage management. In lab sessions, we use the Raspberry Pi as a platform to try stuff and get much closer to the machine than PC OS like Windows or MacOS allow. The lessons will directly lead to you feeling calm and powerful when working on your computer. A worthwhile investment! We will cover chapters from Silberschatz (2018), a standard text on OS concepts, and from Shotts (2019), a complete introduction to the Linux OS.

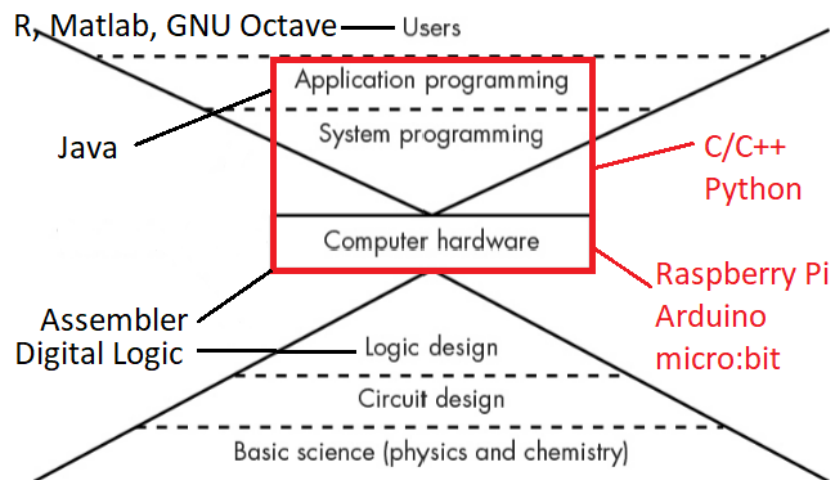


Image: Computer landscape - modified after Steinhart, 2019

4 Student Learning Outcomes

Students who complete CSC 420 "Operating Systems (OS)", will be able to:

- Understand how operating systems manage concurrent processes
- Know OS design principles and implementation strategies
- Know how to configure and run a Raspberry Pi-based Linux box

- Use the command line interface and UNIX-style shell (**bash**)
- Learn how to write simple shell scripts
- Know how to process data with the shell
- Know how to effectively present assignment results
- Know principles and practice of virtualization

5 Course requirements

Some knowledge of, and experience with computers is useful but not critical: we will start from basic concepts. Curiosity and personal discipline are essential. You will gain data literacy skills by taking this course. The course will prepare you for further studies in computer and data science, or in other disciplines that use modern computing, i.e. every discipline, from accounting to zoology).

For a deeper understanding of the concepts, familiarity with basic data structures, computer architecture, and a high-level language, such as C or Java, is useful.

Formal prerequisites according to the Lyon College 2023/24 catalog: CSC 265 (algorithms).

6 Grading system

WHAT	WEIGHT
Assignments	25%
Final Project	25%
Weekly tests	25%
Final exam (optional)	25%

Notes:

- To pass: 60% of all available points.
- Assignments include
- Tests: weekly online quizzes, which are previewed and reviewed in class.
- Final exam: selection of the most challenging weekly quiz questions.

- You only have to write the final exam if you want to improve your grade at the end of the course. If the final exam result is below your final grade average up to this point, it will be ignored.
- There will be numerous (optional) bonus assignments to improve your midterm and final grades.

7 Schedule and session content

For **important dates**, see the 2023-2024 Academic Calendar at catalog.lyon.edu.

No class on: Tuesday/Thursday 19/21 March (Spring break) - Friday 29 March (Easter break). Last day of classes: Wednesday, 8 May. Final exams (non-graduating students): 10-15 May.

Schedule:

WEEK	TEXTBOOK CHAPTERS
1	OS:1 Introduction
2	OS:2 OS Structures
3	OS:3 OS Processes
4	LX:1 What is the Shell?
5	LX:2 Navigation
6	LX:3 Exploring the system
7	LX:4 Manipulating files and directories
8	LX:5 Working with commands
9	LX:6 Redirection
10	LX:9 Permissions
11	LX:10 Processes / 14 Package Mgmt
12	LX:15 Storage Media / 16 Networking
13	LX:17 Searching for files / 18 Archiving and Backup
14	LX:19 Regular Expressions / 20 Text Processing
15	OS:19 Linux vs. Windows
16	

- OS: Operating Systems Concepts (10ed) by Silberschatz et al, Wiley, 2018.
- LX: The Linux Command Line (5e), NoStarch, 2019.

DataCamp:

- **Introduction to Shell:** The Unix command line has survived and thrived for almost 50 years because it lets people do complex things with just a few keystrokes. Sometimes called "the universal glue of programming," it helps users combine existing programs in new ways, automate repetitive tasks, and run programs on clusters and clouds that may be halfway around the world. This course will introduce its key elements and show you how to use them efficiently.
- **Introduction to Bash Scripting:** Bash is a concise, superfast, and robust scripting language for data and file manipulation. It's a vital skill for building analytics pipelines in the cloud, favored by Linux users to work with data stored across multiple files. In this course, we'll guide you through the basics of Bash scripting. We begin with an introduction to Bash script structures, including inputting arguments and outputting results. You'll then work through data structures, such as variables and arrays, and control statements, including loops and conditionals. You'll then put what you've learned into practice, by creating your own Bash functions and scheduling automated scripts to run like clockwork with cron.
- **Data processing in Shell:** We live in a busy world with tight deadlines. As a result, we fall back on what is familiar and easy, favoring GUI interfaces like Anaconda and RStudio. However, taking the time to learn data analysis on the command line is a great long-term investment because it makes us stronger and more productive data people. In this course, we will take a practical approach to learn simple, powerful, and data-specific command-line skills. Using publicly available Spotify datasets, we will learn how to download, process, clean, and transform data, all via the command line. We will also learn advanced techniques such as command-line based SQL database operations. Finally, we will combine the powers of command line and Python to build a data pipeline for automating a predictive model.

Workload: approx. 4-5 hours per week.

1. Class time = $16 * 3 * 50/60 = 40$ hours
2. Tests (home) = $16 * .5 = 8$ hours
3. DataCamp assignments: $13 * 2 = 26$ hrs (approx.)