

## CMOR 420/520: Computational Science Fall 2025 · Rice University

**Lectures: MWF 11am-11:50am, Location: Duncan Hall 1064**

**Instructor: Elizabeth Hawkins (eh107@rice.edu), Duncan Hall 2001**

**Office hours: Friday 12-1pm or by appointment.**

**Overview.** This course is an introduction to basic computational tools and techniques in scientific computing. We will cover core technologies (e.g., Linux, Git, LaTeX), as well as basic programming principles relevant to applied mathematics. Students will be introduced to C and C++. The course is intended to teach fundamentals of each language and software tools (how do I design a software package? How do I reuse existing libraries for critical tasks?). However, the course materials are applicable beyond a specific software library or application area.

**Outcomes.** After the course, the student should be able to independently perform an “end-to-end” computational task. For example, the student should be able to write a technical paper describing a research idea, and then develop and collaborate on a software project to validate methods developed in that paper. In the likely event that this course did not cover a technology well-suited for a computational task, the student should leave with the ability to seek out and learn an appropriate tool and to apply it to their task.

**References.** Lecture notes (on Canvas) will be the primary reading materials for the course. This course has no required textbooks. If you’re interested in textbooks or reference materials that may be useful, the following are good starting points, and should be available online or from the library:

- “The Missing Semester”: <https://missing.csail.mit.edu/>
- Dr. Huchette’s course notes
- Frank Mittelbach, Michel Goossens, Johannes Braams, David Carlisle, and Chris Rowley, LaTeX
- Companion: Tools and Techniques for Computer Type Setting, 2nd Edition, 2004.
- Brian Kernighan and Dennis Ritchie, The C Programming Language, 2nd Edition, Prentice Hall, 1988.
- Bjarne Stroustrup, The C++ Programming Language, 2nd Edition, Addison Wesley, 2013.

**Prerequisites.** Informally, “mathematical maturity”: i.e., a familiarity and comfort with higher-level mathematical thought. Prior programming experience is a plus, but not necessary.

**Technology.** Access to a programmable computer is essential for this course. If you do not have ready access to a computer, please contact the instructor by the end of the first week of classes.

**Tentative course topics.** These are subject to change depending on student interest and rate of progress.

- The Linux terminal
- Basic tools: Git, LATEX
- The C programming language
  - Compilers, linking, Makefiles.
  - Basic data types, structs, pointers.
- The C++ programming language
  - References, function overloading, constructors.
  - Classes, inheritance, templating.
  - Numerical libraries

**Grading policy.** Students will be graded based coding projects (100%), each roughly equivalent to a problem set in terms of complexity and required effort. Students are responsible for ensuring that graders can easily compile, run, and understand their code. You are encouraged to discuss assignments with other students, but the final write-up (including computer code) must be entirely your own work. Likewise, you are encouraged to use online resources (e.g. searching StackOverflow to diagnose and fix a bugs in your code), but directly copying full codes (from online sources or elsewhere) is strictly forbidden.

**Late policy.** Late assignments will be automatically penalized 10% per day.

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

**Rice Honor Code.** It is an honor code violation to turn in code or solutions which have, in all or in part, been copied from another student (including computer codes). It is also an honor code violation to consult solutions to the homework or exams from previous sections of this or similar classes. In this course, all students will be held to the standards of the Rice Honor Code ([link](#)), a code that you pledged to honor when you matriculated at this institution. If you are unfamiliar with the details of this code and how it is administered, you should consult the Honor System Handbook at <http://honor.rice.edu/honor-system-handbook/>. This handbook outlines the University's expectations for the integrity of your academic work, the procedures for resolving alleged violations of those expectations, and the rights and responsibilities of students and faculty members throughout the process.