

Computing for Scientists

Basic Course Information

Class number: 1118

Units: 3 units

Lecture Time: MW, 4:00 – 5:15 pm

Lecture Location: Hashinger 222

Course Website: <https://canvas.chapman.edu/courses/34237>

Github Repository: <https://github.com/CS510-Fall2021/CourseInfo>

Slack Workspace: [Click here](#)

Course Description: This course introduces students to the fundamental math and algorithms of the basic computational methods required to succeed in advanced study in the computational and data sciences. In this course students will learn computer arithmetic, software development, and become proficient with the use of MATLAB, Python and/or other programming languages. The course will also focus on scientific computing by designing and analyzing algorithms for solving mathematical problems. Students will be able to derive information from a collection of data by designing algorithms involving data interpolation, regression analysis, data smoothing and forecasting, spectral method and dimensionality reduction.

Instructor Information

Instructor: Lindsay Waldrop, Ph.D.

Email address: waldrop@chapman.edu

Office Location: 268 Keck **Office Hours:** Online and in person Zoom Personal Meeting Room: 679 411 2215

Tuesdays 9 – 11 am, Fridays 2:00 – 3:00 pm, and by appointment. (Subject to change.)

Course Materials

- Required text: *Advanced R* by Hadley Wickham. Second edition, CRC Press.
Online at <https://adv-r.hadley.nz/>
- Recommended: *R Graphics Cookbook* by Winston Chang. First Edition, O'Reilly Media. ISBN 9781491978603.
Online at <https://r-graphics.org/>
- Course fees: none

Course Learning Outcomes:

At the completion of this course, students should be able to:

1. Become proficient in the use of the *R* language.
2. Become familiar with the use of Bash, shell programming, and console editors.

3. Learn the basic principles of software design.
4. Produce code that is reproducible and produces results that are replicable.
5. Learn to interact with HPC resources.
6. Learn how to document your work and prepare scientific publications.

Program Learning Outcomes:

This course provides students with training in the following program learning outcomes (identified by degree):

- Graduates will develop quantitative reasoning skills which will enable them to: A. Solve problems by utilizing extrapolation, approximation, precision, accuracy, rational estimation and statistical validity. B. Interpret data. C. Create quantitative models to describe natural phenomena.
- Graduates will be able to apply the principles of computational science to scientific problems. Students will develop critical thinking, end to end problem-solving, and data analysis skills. With these skills, they will be able to: A. Collect, process and analyze data B. Prioritize different potential solutions to a problem C. Use advanced mathematics and computing to solve scientific problems.

Course Policies

General Expectations: Learning depends on engagement, and engagement depends on both the relationship between students and instructors and the general learning environment. Engagement is a relationship, and like any other relationship, depends on two people: the instructor and the student. I will do my part to come to class prepared with interesting material and a science-based lecture style that includes active learning techniques. I expect you to come to class prepared by completing any assignments and willing to participate in your own learning. Furthermore, I expect you to cultivate a positive and welcoming learning environment for you and your fellow students.

...In the time of COVID: I realize that the COVID pandemic is impacting students both broadly and deeply and in ways that I won't (or can't) fully understand. Just doing the bare minimum seems like an accomplishment these days amid the chaos. With that in mind, I encourage you to attend class, focus on content during class, and complete assignments in a timely manner. However, if you don't or can't, *IT'S OK*. Here's what this means:

- Deadlines on homeworks are suggestions, and meeting them is optional. I will check in with you if you start falling behind to make sure that things are as OK as they can be, or if I can provide extra resources to help. If you want a grade assigned at the end of the semester, please complete all work (that isn't the final project) by the last day of classes. If this becomes unworkable, let me know and we can discuss an incomplete so you can finish later.

- Participation is mandatory in the class, but it is a choose-your-own-adventure type of deal. It can be any mixture of attending class, participating in lecture material, attending office hours, sending me interesting and related things you come across, one-on-one meetings with me where we discuss class material, and anything else that demonstrates you are actively engaging in the class material.

Grading Scheme:

- **Participation (10%):** Class participation includes attendance at all class meetings, asking and answering questions, participating in class activities, one-on-one meetings, etc.
- **Assignments (15%):** in-class and out-of-class assignments other than projects.
- **Midterm Project (25%):** Coding project chosen by the student.
- **Midterm Project Revision (25%):** Revision of the midterm coding project.
- **Final Project (25%):** Write up of final project based on the midterm project and its revision.

Methods of evaluation:

- Students will be evaluated by a series of assignments following each lecture. Scoring will be based on completing exercises.
- Students will be evaluated by participation, which can include attendance, in-class participation in exercises and activities, attending office hours, and one-on-one meetings.
- Students will be evaluated by the instructor and their peers on the degree to which their code is functional, reproducible, accessible, and documented.
- Students will be evaluated by the instructor and their peers on the degree to which their final project is presented as professional, complete, reproducible, and documented.

Grading Policies:

- In order to provide you with timely feedback, I will grade work as soon as possible following the due date and time. If you submit after that time, you may experience a delay in feedback.
- My feedback tends to be very direct, which can be off putting to some students. I want to see you succeed, and the best way for me to do that is to tell you what you are doing well, and what you could be doing better. I strive to make my feedback constructive, so keep that in mind when reviewing feedback.
- Mistakes happen, and I am not perfect. If you find mistakes in my grading (missed points, arithmetic errors, etc) or you think your work deserves a second look, please submit your argument in writing (an email is preferable) along with the original assignment within one week of when the assignment was returned, and I will take another look. I will not regrade work at the end of the semester for any reason.

Final Project Policy: You must pass the final project in order to pass the course. *There will be no exceptions to this policy.*

Electronic Devices (phones, computers, etc): Please refrain from inappropriate usage of electronic devices during class. I reserve the right to ask you to discontinue the use of any electronic device which becomes a significant distraction to your classmates or me.

Class Recordings: In this class, software will be used to record live class discussions. As a student in this class, your participation in live class discussions will be recorded to assist those who cannot attend the live session, or to serve as a resource for those who would like to review content that was presented. These recordings will be made available only to students who are enrolled in the class, and only during the period in which the course is offered. All recordings will become unavailable to students in the class shortly after the course ends. Students who prefer to participate via audio only will be allowed to disable their video camera so only audio will be captured. Please discuss this option with your instructor. *Do not make your own recordings. Do not share my recordings with others or post them or screenshots publicly. Doing this is a violation of privacy, and it will result in sanctions.*

Group Work: I encourage group work on all assignments and during class, except those explicitly stated to be *individual evaluations*. You are free to assume that an assignment is meant to be worked on together unless otherwise directed. If you work in groups on an assignment, simply list the members of your group on the top of the assignment.

Communication: Please use Slack. I reply to emails once a day within regular working hours (9 am to 5 pm, M-F). I will try my best to respond within one working day. For a quicker answer, try Slack instead. Please check the syllabus before asking a question about the course. Detailed questions are best asked during office hours, you will get a better and more thorough answer. If your question takes > 3 mins to respond to, I will ask you to come to office hours. Please treat email as formal communication.

Chapman University Policies

In response to the current COVID-19 pandemic: Chapman University has developed the CU Safely Back program (CUSBP) and mandatory safety measures (<https://news.chapman.edu/corona-virus/>). The University's mandatory safety measures may be stricter than local, state or federal guidelines and may be subject to change at any time. Students are expected to adhere to the University's safety measures while attending classes, including when entering and exiting classrooms, laboratories, or other instructional areas. Individual faculty may choose to have requirements for their courses that are stricter than the University's*. Safety precautions and procedures may change in response to emerging findings and the recommendations of scientific experts and authorities. Refusal to abide by the University's mandatory safety measures or to the safety requirements specific to this course will result in your being asked to leave the area immediately, and may result in an administrative dismissal from this course. The COVID-19 pandemic requires all of us to accept the possibility that changes in how this course is taught may be required and that some changes may

occur with little or no notice. For example, some or all of the in-person aspects of a course may be shifted to remote instruction. If this occurs, you will be given clear instructions as to how to proceed. The uncertainty of the situation is not ideal for any of us. We must all try to approach this situation with good-will, flexibility, and mutual understanding. (*Such requirement should be clearly described in the course syllabus.)

SEB statement of support: In response to the COVID-19 pandemic, the Chapman University Senate Executive Board supports the Faculty Task Force recommendations and the adoption of safety protocols, including symptom screening, mandatory face covers, social distancing practices, frequent hand washing or sanitizing, and frequent cleaning procedures for in-person class sessions and other on-campus activities. The SEB further supports that office hours and other meetings be held remotely, whenever possible, to minimize risks to students, faculty, and staff.

Academic Integrity Policy: Chapman University is a community of scholars that emphasizes the mutual responsibility of all members to seek knowledge honestly and in good faith. Students are responsible for doing their own work and academic dishonest of any kind will be subject to sanction by the instructor/administrator and referral to the university Academic Integrity Committee, which may impose additional sanctions including expulsion. Please review the full description of Chapman University's policy on [Academic Integrity](#).

Students with Disabilities Policy: In compliance with ADA guidelines, students who have any condition, either permanent or temporary, that might affect their ability to perform in this class are encouraged to contact the [Office of Disability Services](#). If you will need to utilize your approved accommodations in this class, please follow the proper notification procedure for informing your professor(s). This notification process must occur more than a week before any accommodation can be utilized. Please contact Disability Services at (714) 516-4520 if you have questions regarding this procedure, or for information and to make an appointment to discuss and/or request potential accommodations based on documentation of your disability. Once formal approval of your need for an accommodation has been granted, you are encouraged to talk with your professor(s) about your accommodation options. The granting of any accommodation will not be retroactive and cannot jeopardize the academic standards or integrity of the course.

Equity and Diversity Statement: Chapman University is committed to ensuring equality and valuing diversity. Students and professors are reminded to show respect at all times as outlined in Chapman's Harassment and Discrimination Policy. Any violations of this policy should be discussed with the professor, the Dean of Students and/or otherwise reported in accordance with this policy.

Student Support at Chapman University

Over the course of the semester, you may experience a range of challenges that interfere with your learning, such as problems with friend, family, and or significant other relationships; substance use; concerns about personal adequacy; feeling overwhelmed; or feeling sad or anxious without knowing why. These mental health concerns or stressful events may diminish your academic performance and/or reduce your ability to participate in daily activities. You can learn more about the re-

sources available through Chapman University's Student Psychological Counseling Services here: <https://www.chapman.edu/students/health-and-safety/psychological-counseling/>.

Fostering a community of care that supports the success of students is essential to the values of Chapman University. Occasionally, you may come across a student whose personal behavior concerns or worries you, either for the student's well-being or yours. In these instances, you are encouraged to contact the Chapman University Student Concern Intervention Team who can respond to these concerns and offer assistance: <https://www.chapman.edu/students/health-and-safety/student-concern/index.aspx>. While it is preferred that you include your contact information so this team can follow up with you, you can submit a report anonymously. 24-hour emergency help is also available through Public Safety at 714-997-6763.

Additionally, you can come talk to me at any time, for any reason. My (virtual) door is open!