Discovering Computer Science: Scientific Data and Dynamics

CS 111

Instructor Info

Prof. David M. Kahn

Office Hrs: by appointment on Mon 2:30pm-4:30pm, walk-in on Wed 2:30pm-4:30pm and Thurs 9:30am-10:30am

Olin 212

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kahnd@denison.edu

Course Info

Prereq: None

Mon, Wed, & Fri

9:30am-10:20am

Olin 217

TA Info

Jonah Richardson

Office Hrs: Tues 10am-11am, Thurs 1pm-3pm

Olin 217

richar_j1@denison.edu

Course Description

This course is an introduction to computational problem solving. Students will develop their abilities to abstract (or model) otherwise complex problems and generate elegant and efficient solutions. Students will practice these skills by developing computer programs that solve problems motivated by research in the sciences. Additional topics may include Monte Carlo methods, data analysis, population dynamics, computational biology, genetic algorithms, cellular automata, networks, data mining, and fractals. Students may earn credit for at most one of CS 109, CS 110, CS 111, and CS 112. Absolutely no prior experience is necessary.

Learning Goals

After taking this class, a student will be able to

- approach problems computationally and algorithmically
- abstract over data and functions
- use Python as a scientific tool
- evaluate basic code correctness and efficiency

Academic Credit

This course fulfills a (non-lab) science divisional requirement for Denison's general education requirements. This course also adheres to Denison's Academic Credit Policy, including a weekly expectation of 8 hours of work outside class on average.

Textbook

Discovering Computer Science by Jessen Havill. 2nd Ed. ISBN: 9780367613358 (The book can be obtained here.)

Grading Scheme

Grades are intended follow the standard scale: grade percents in the 90s are As, 80s are Bs, 70s are Cs, and 60s are Ds, and pluses/minuses are the upper/lower thirds, respectively, of each 10% range. However, I still reserve the right to curve grades and adjust cutoffs in extenuating circumstances.

Grades are derived from the following categories with their corresponding weights:

5%	Exercises
30%	Quizzes
50%	Projects
15%	Final Project

Exercises

Exercises are short assignments graded by completion. On a day when an exercise is due, it must be electronically submitted prior to the start of class. That day, the exercise will be briefly discussed in class with classmates, unless indicated otherwise. I reserve the right to make the completion grade contingent upon attending the discussion.

Quizzes

Quizzes are in-class, individual, written assessments. Make sure to bring a writing implement on quiz days. The lowest quiz grade will be dropped.

FAQs

How do I set up Python?

Many sets of instructions can be found online, like here. Please make sure to install some version of Python 3 (like Python 3.11.4). Instructions will also be given in one of the first assignments.

What do you use for coding in Python?

I personally use VSCode with Microsoft's Python extension enabled. I also change the settings of Pylance (an extension included in the Python extension) to turn on type checking mode.

What is Python good for?

By some metrics, Python is the most popular programming language in use today. It is used in a wide variety of applications ranging from Instagram (social media) to PyTorch (machine learning) and more. Python is favored for its readable syntax, its simple setup, and its huge ecosystem of libraries.

Projects

Projects are coding assignments done individually or in small groups, as indicated by the assignment. Projects typically involve both a coding and writing component. The lowest project grade will be dropped.

Final Project

The final project is a bigger version of a project. It is due on Sunday, December 15th at 11am, which is the end of the exam slot for this class.

External Collaboration

Unless noted otherwise, you may collaborate with students external to your assignment group. However, if you do, you *must* adhere to the following guidelines. Failure to do so can result in an academic integrity violation.

- *Attribution Policy* – You must submit some short citation text with your assignment that lists the following 3 points: who you worked with, what parts of the assignment each person worked on, and a sentence or so for each person describing the nature of your collaboration. For example, "Eva Tardos showed me how to use a loop on question 3".
- *Whiteboard Policy* – Students should approach external collaboration as follows: They work out their answers together on a whiteboard (or similar), but do not yet formally write up their submissions. Then they fully erase that whiteboard. Finally, each member goes off to write their solutions alone, with no recorded notes of the whiteboard contents. This policy allows ideas to be shared between students, but their written solutions should not match.

You may also consult reference materials from outside sources to help with your assignments, such as academic papers and tutorials, *as long as they are cited and the assignment does not disallow their use.* You may *not* view solution manuals, ask help forums/generative AI for solutions, or engage in similar conduct that would cause the work you submit to not be your own.

Citation is key to maintaining academic integrity. Nonetheless, note that copied solutions are not eligible for credit even with proper citation.

Late/Make-Up Policy

Exercises will only be accepted late for excusable reasons (e.g. sickness, athletic travel, family emergency, etc.).

Extra time will not be given for arriving late to a quiz. If you know you will be absent the day of a quiz, then you must let me know in advance to work out alternative accomodations.

Late projects will only accepted one day late with a 25% penalty before noon and a 50% penalty after noon.

I reserve the right to relax this policy for extenuating circumstances. Do not hesitate to let me know if additional accomodation might be needed.

Contact Policy

Office hours are your times to talk to me in person about whatever, and I arrange them by appointment on Mondays, but you can just walk in Wednesdays and Thursdays. Appointments are made via the Canvas calendar. First click the "Find Appointment" button to show the available appointments. Then you click the slot you want to reserve it. Feel free to bring others to the appointment if you have similar matters to discuss.

If something comes up while taking this course, big or small, do not be afraid to contact to me about it. Life happens, and existing in the "real world" always involves balancing and negotiating different deadlines and responsibilities. I will do my best to respond to emails within one or two business days.

AI Policy

AI tools like ChatGPT and GitHub Copilot have risen heavily in popularity. Many modern programmers do use such AIs in their workflow. Unless otherwise noted, I will not ban you from using such tools. However, I do require that they are treated like any other source: you may *not* ask them to generate solutions, and you may *not* copy their outputs. Such tools may only be used to, e.g., provide high-level reference or a partner to bounce ideas off of. Additionally, the use of such tools must be cited just like a group partner. Failure to do so can result in an academic integrity violation.

Beware: these tools are very good at sounding correct even when they are wrong. They struggle especially with quantitative and technical reasoning, like the content of this course. In the end, you are fully responsible for anything you submit, so consider such tools carefully.

Academic Integrity

Proposed and developed by Denison students, passed unanimously by DCGA and Denison's faculty, the Code of Academic Integrity requires that instructors notify the Associate Provost of cases of academic dishonesty. Cases are typically heard by the Academic Integrity Board which determines whether a violation has occurred, and, if so, its severity and the sanctions. In some circumstances the case may be handled through an Administrative Resolution Procedure. Further, the code makes students responsible for promoting a culture of integrity on campus and acting in instances in which integrity is violated. Academic honesty, the cornerstone of teaching and learning, lays the foundation for lifelong integrity.

Academic dishonesty is intellectual theft. It includes, but is not limited to, providing or receiving assistance in a manner not authorized by the instructor in the creation of work to be submitted for evaluation. This standard applies to all work ranging from daily homework assignments to major exams. Students must clearly cite any sources consulted—not only for quoted phrases but also for ideas and information that are not common knowledge. Neither ignorance nor carelessness is an acceptable defense in cases of plagiarism. It is the student's responsibility to follow the appropriate format for citations. Students should ask their instructors for assistance in determining what sorts of materials and assistance are appropriate for assignments and for guidance in citing such materials clearly.

Note on Technology: Unauthorized use of technology (including, but not limited to, artificial intelligence sites and translation programs) in the preparation or submission of academic work can be considered a form of cheating and/or plagiarism. Instructors may at their discretion create assignments that incorporate the use of supporting technologies and will inform students of acceptable uses of technology in their courses. It is the responsibility of the student to ask the instructor for clarification whenever they are unclear about the parameters of a specific assignment and to understand that presenting the work of artificial intelligence as your own constitutes a violation of Denison's Code. Cases of suspected inappropriate use of technology may be submitted to the Academic Integrity Board to initiate an investigation of academic dishonesty. For further information about the Code of Academic Integrity, see `http://denison.edu/academics/curriculum/integrity`.

Penalty

I would rather you turn in a partially complete assignment than intentionally commit an academic integrity violation—or even turn in no assignment at all. For this reason, I will seek to assign a grade lower than 0%, specifically *negative fifty percent* (-50%), to the affected assignment in the event a Type II violation is found to have occurred. Rather than violate academic integrity, I heavily encourage you to work with TAs, use Denison's academic resources, or contact me for help.

Attendance Policy

Denison's Attendance Policy states: A hallmark of a Denison education is the small, interactive, and participatory classroom situated within a residential community. Therefore, it is essential that students be present on campus and attend the classes in which they are enrolled. Attendance policies are designed to promote the success and well-being of the individual students as well as the community of learners in each class and co-curricular undertaking. For oneself and one's peers, attendance and presence on campus are vital to the Denison education. Students are expected to be aware of the attendance policy expectations for this course. Attentive presence in class is essential to facilitate a productive learning environment.

Students with Disabilities

Students with a documented disability should complete a Semester Request for Accommodations through their My Accommodations app on MyDenison . It is the student's responsibility to contact me privately as soon as possible to discuss specific needs related to your learning in the classroom and studying. I rely on the Academic Resource Center (ARC) located in 020 Higley Hall, to verify the need for reasonable accommodation based on the documentation on file in that office. Reasonable accommodation cannot be applied retroactively and therefore ideally should be enacted early in the semester as they are not automatically carried forward from a previous term and must be requested every semester.

Logistic arrangements for testing-related accommodations should be made at least a week in advance of an evaluation and follow the Exam Accommodation Policy.

Appropriate Use of Course Materials

As an institution which strives to inspire and educate our students to become discerning moral agents and active citizens of a democratic society, we are committed to complying with all laws regarding copyright throughout the University. This syllabus and all course materials used in this course may be copyrighted and accordingly will be governed by the provisions of the U.S. copyright law (for an overview see `https://copyright.gov/circs/circ01.pdf` and for fair use guidelines see `https://copyright.gov/fair-use/`). In particular, posting any course materials on commercial sites or creating a bank of materials for distribution to other students may be considered a violation of the University's Code of Academic Integrity as well as a breach of copyright law. If you have any questions about these guidelines, please speak with your instructor.

Writing Center

Every writer—no matter the course or their experience level—needs a reader and benefits from deep conversation about their work! At the Writing Center, student consultants are eager to support you at any stage of the writing process including (but not limited to): deciphering assignment instructions, brainstorming, developing an argument, organizing your ideas, integrating research and sources, working with faculty feedback, and/or polishing a draft. Consultants, who are themselves experienced writers from a range of areas of study, are specially trained to support writing for any course or purpose from lab reports, research papers, and informal writing assignments to cover letters, personal statements, and other application materials. The Center welcomes writers from all backgrounds and levels of college preparation. Appointments can be scheduled for 25 or 50 minutes at `https://denison.mywconline.com/` and take place in-person in the Atrium level of the Library (A22).

Multilingual Support

Students who use English in addition to other languages are welcome to use the resources available at the Multilingual Learning Office (MLO). The MLO includes Morayo Akinkugbe, PhD, the Assistant Director of Multilingual Programming and Support; Anna Adams, the English Language Support Specialist; and the student consultants who work with them. They are all trained and experienced in helping students address the different issues that arise when working in more than one language. If English is not your first or only language, please consider utilizing this resource, which is available to ALL Denison students. Dr. Akinkugbe, Ms. Adams, and the student consultants offer a variety of support for L2 students, including consulting with you about your written language (grammar, syntax, word-choices), developing strategies to manage your reading assignments, assisting with class conversation and presentations, and helping to devise ways to develop and effectively use all your skills in English. You can set up an appointment via `https://denisonuappointments.as.me/mlo`, or by emailing the Multilingual Learning Office directly at englishhelp@denison.edu.

Reporting Sexual Misconduct

Essays, journals, and other coursework submitted for this class are generally considered confidential pursuant to the University's student record policies. However, students should be aware that University employees are required by University policy to report allegations of discrimination based on sex, gender, gender identity, gender expression, sexual orientation, or pregnancy to the Title IX Coordinator. This includes reporting all incidents of sexual misconduct, sexual assault, and suspected abuse/neglect of a minor. Further, employees are to report these incidents that occur on campus and/or that involve students at Denison University whenever the employee becomes aware of a possible incident in the course of their employment, including via coursework or advising conversations. There are others on campus to whom you may speak in confidence, including clergy and medical staff and counselors at the Wellness Center. More information on Title IX and the University's Policy prohibiting sex discrimination, including sexual harassment, sexual misconduct, stalking and retaliation, including support resources, how to report, and prevention and education efforts, can be found at: `https://denison.edu/campus/title-ix`.

Peer Learning Strategies

The Peer Learning Strategists (PLS) program was developed by Denison students and faculty for those in introductory science classes. It is an initiative of a larger program called RAISE (Readiness and Inclusion in Science Education) and is a great resource to learn how to *study more efficiently* and *learn more effectively*. The PLS program employs peer-to-peer mentoring focused on teaching overarching learning strategies crucial to success in college science classes. Trained science majors work as PLS mentors to help hone your learning approach since skills most helpful in college often differ from skills that led to high achievement in high school. Students meet one-on-one with a PLS mentor one hour weekly for at least three weeks with some students continuing beyond the three-sessions recommendation. PLS mentors are not tutors, content is not course-specific, and conversations provide space for attaining skills for lifelong learning and success. Contact Science Initiatives Coordinator Jeni Miller or Dr. Melanie Lott with additional questions.

Attribution for This Document

Dates

8/30	-		
9/2	Exercise 1 due before class	10/21	Exercise 15 due before class
9/4	Exercise 2 due before class	10/23	Project 4 due 11:59pm
9/6	Exercise 3 due before class	10/25	Exercise 16 due before class
9/9	Exercise 4 due before class	10/28	Exercise 17 due before class
9/11	Project 1 due 11:59pm	10/30	Quiz 4 in class (last day to drop)
9/13	Exercise 5 due before class	11/1	Exercise 18 due before class
9/16	Exercise 6 due before class	11/4	Exercise 19 due before class
9/18	Quiz 1 in class	11/6	Project 5 due 11:59pm
9/20	Exercise 7 due before class	11/8	Exercise 20 due before class
9/23	Exercise 8 due before class	11/11	Exercise 21 due before class
9/25	Project 2 due 11:59pm	11/13	Quiz 5 in class
9/27	Exercise 9 due before class (family weekend begins)	11/15	Exercise 22 due before class
9/30	Exercise 10 due before class	11/18	Exercise 23 due before class
10/2	Quiz 2 in class	11/20	Project 6 due 11:59pm
10/4	Exercise 11 due before class	11/22	Exercise 24 due before class (last day before Thanksgiving break)
10/7	Exercise 12 due before class	12/2	Exercise 25 due before class
10/9	Project 3 due 11:59pm	12/4	Quiz 6 in class
10/11	Exercise 13 due before class	12/6	Exercise 26 due before class
10/14	Exercise 14 due before class	12/9	Exercise 27 due before class
10/16	Quiz 3 in class	12/11	Exercise 28 due before class
	(fall break)	12/12	Exercise 29 due before class
		12/15	Final Project due 11am