CMPU 145
Foundations of Computer Science
Spring 2020

Monday & Thursday, 3:10–4:25 p.m.
Sanders Physics 105

Friday, 11:00 a.m.–1:00 p.m.
Sanders Physics 309

Prof. Jonathan Gordon

Overview

This course introduces the theoretical, structural, and algorithmic foundations of computer science. Topics include: sets, relations, functions, recursive data structures, recursive functions, induction, structural induction, probability, logic, and Boolean algebra. The course will emphasize the exploration of these topics through programming exercises, but it will also focus on developing proof techniques in written exercises. A weekly laboratory period provides guided hands-on experience.

Prerequisites

CMPU 101: Problem-solving and Abstraction

Although this course covers the mathematical theory behind computer science, the only math you need as a prerequisite is high-school algebra. Everything else will be introduced as we go.

Course Goals

By the end of the semester, you should understand:

• how to model computational problems using discrete structures
• how to prove a claim rigorously
• the intimate connection of mathematical theory and computing practice

This course provides essential background for 200-level computer science courses. It forms the immediate basis for the exploration in CMPU 240 (Language Theory and Automata) of the limits of computation; ideally, you should take this the following semester.
Calendar

The calendar with lecture notes, assigned readings and exercises, and exams is on the course website and will be updated throughout the semester.

Office hours will be listed on the instructor’s website. In addition to faculty office hours, student coaches will be available during scheduled labs and at other peak hours of laboratory use, such as evenings and weekends. The coaching schedule will be published online.

Class Sessions

The class sessions are intended to augment and support the material in your readings by providing an opportunity for in-depth discussion of topics, working through examples, and the chance for you to ask questions.

The material covered each week builds on what was covered in prior weeks. As such, it is essential that you attend every lecture and keep up with the reading assignments.

As a courtesy to your classmates and your instructor, the use of computers, tablets, mobile phones, or other electronic devices during lectures is discouraged. If for any reason it is important that you use such a device during lecture, please talk to me about how we can best accommodate you.

Textbook

*Sets, Logic and Maths for Computing*, second edition
David Makinson

The textbook is available for free online. From outside the Vassar network, you may need to search for the book on the library website, which will prompt you to log in. The textbook is also available for sale at the Vassar bookstore.

There will be occasional supplemental readings made available on the class website or distributed in class.

Computing Environment

We will use Racket (The Language Formerly Known as Scheme) in the DrRacket programming environment. DrRacket is installed on the Linux workstations in our classroom and labs. It can also be downloaded from [racket-lang.org](http://racket-lang.org) if you want to install it on your own computer. Programs written in DrRacket have the same behavior on all platforms (e.g., Linux, macOS, Windows). Therefore you do not need to worry what kind of machine you use when you run DrRacket programs.
Depending on which professor you had for CMPU 101, you learned to program in dialects of Racket or Scheme using one of the following two texts:

1. *Introduction to Computer Science via Scheme*, draft.  
   Luke Hunsberger

   Matthias Felleisen, Robert Bruce Findler, Matthew Flatt, and Sriram Krishnamurthi

You may find it helpful to review material from these introductory texts during this course. The website for the Racket language also provides a quick reference page and The Racket Guide for more details.

Coursework

To assess your understanding of the topics presented in this course, there will be weekly labs, regular homework assignments, a midterm exam, and a final exam (during the final exam period).

Labs

The purpose of the labs is to give you hands-on programming experience using the concepts from the lectures. Some lab sessions may also include lectures.

Lab sessions are two hours long. Many labs can be completed in less time, and you can leave when your lab work has been checked by the instructor or a coach. However, everybody works at different speeds, and some labs may take longer than I anticipate. This is fine; the labs are intended to be practice, where you can get help working through problems.

If I decide a lab is too long – essentially, if most of the class didn't complete it – I’ll count some of the lab as extra credit for those who finished, and we’ll go over it during the next class.

Otherwise, if you need a bit more time to finish the lab work, you should have what you’ve finished checked before the lab period ends, and you can then finish your lab work any time before the next class. If you come in during coaching hours, the coach can check off your work. Otherwise, submit the files, and I’ll check it after the next class.

Lab work won’t be accepted after the start of the next class because I’ll be sharing example solutions at that time for everyone’s benefit.

Assignments

There will be regular assignments, typically one every week or so. Some of the problems on these assignments will require you to write, test,
and run programs; others will require you to write proofs using techniques discussed in class.

Additional instructions will be provided with the first assignment. As with all policies, homework policies are intended to be fair to everyone involved in the course, so I will do my best to enforce them fairly. Please feel free to ask me any questions about specific cases that may emerge over the semester.

Exams

There will be a midterm exam that will take place in lieu of the lab session for that week, and there will be a regularly scheduled final exam. The exams are open-book, open-note.

Course Grades

The elements of the course will be weighted approximately as follows:

- Assignments 40%
- Labs 20%
- Midterm Exam 20%
- Final Exam 20%

Attendance and Lateness

If you are unable to attend class on the day of an exam, it is your responsibility to notify the instructor in advance to make other arrangements. Late assignments will be penalized, and will not be accepted once solutions have been posted or discussed in class.

Academic Integrity

All assignments must be done individually; collaboration is not allowed unless it has been explicitly authorized.

Receiving and copying solutions (code, pseudocode, proofs, etc.) from any source (a classmate, a friend, a published text, an online source, etc.) is disallowed. Note that using code or other material from sources (other than those explicitly given as course resources) as “inspiration” and submitting highly derivative solutions is viewed as copying.

Please read “Going to the Source”, available from the Dean of the College website. Note that the guidelines that apply to writing in general apply equally to the writing of computer programs. Copying someone else’s code without attribution is plagiarism. Give proper attribution for the help you receive.

Quoting from Chapter X, “In suspected cases of plagiarism, the instructor prepares a written statement of complaint to the Academic
Panel.” Please don’t put yourself or your professor in that position. When in doubt, stop and ask me first.

Academic Accommodations

Academic accommodations are available for students registered with the Office for Accessibility and Educational Opportunity (AEO). Students in need of disability (ADA/504) accommodations should schedule an appointment with me early in the semester to discuss any accommodations for this course that have been approved by the Office for Accessibility and Educational Opportunity, as indicated in your AEO accommodation letter.

Title IX

Vassar College is committed to providing a safe learning environment for all students that is free of all forms of discrimination and sexual harassment, including sexual assault, relationship abuse, and stalking. If you (or someone you know) has experienced or experiences any of these incidents, know that you are not alone. Vassar College has staff members trained to support you in navigating campus life, accessing health and counseling services, providing academic and housing accommodations, helping with legal protective orders, and more.

Please be aware all Vassar faculty members are “responsible employees,” which means that if you tell me about a situation involving sexual harassment, sexual assault, relationship abuse, or stalking, I must share that information with the Title IX Coordinator. Although I have to make that notification, the Title IX office will only provide outreach by email. You will control how your case will be handled – you don’t have to read or respond to the email, and it is completely up to you whether to pursue a formal complaint. Our goal is to make sure you are aware of the range of options available to you and have access to the resources you need.

If you wish to speak to someone privately, you can contact any of the following on-campus resources:

- Counseling Service (counselingservice.vassar.edu, 845-437-5700)
- Health Service (healthservice.vassar.edu, 845-437-5800)
- Nicole Wong, SAVP (Sexual Assault and Violence Prevention) director (savp.vassar.edu, 845-437-7863)
- SART (Sexual Assault Response Team) advocate, available 24/7 by calling the CRC at 845-437-7333 and asking for SART

The SAVP website (savp.vassar.edu) and the Title IX section of the EOA website (eoaa.vassar.edu/title-ix) have more information, as well as links to both on- and off-campus resources.
Acknowledgments

This course – and this syllabus – is based in large part on work by other professors, especially Luke Hunsberger.