

# CS 220: Theory of Computation

## Syllabus – Fall 2019

**Instructor:** Nathan Sommer

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**Phone:** 330-263-2393

**Office Location:** Taylor 313

**Office Hours:** Tuesdays 1-2 PM, Thursdays 10-11 AM and 3-4 PM, Fridays 1-2 PM

**Meeting Time:** MWF, 10:00 AM to 10:50 AM in Taylor 210

**Course Web Site:** [csweb.wooster.edu/nsommer/cs220](http://csweb.wooster.edu/nsommer/cs220)

**Slack Workspace:** cs220s19

### Course Description

The theory of abstract machines and formal languages is introduced in this course. Computability by finite automata, pushdown automata, and Turing machines is examined and related to pattern matching, lexical analysis, compilation and programming for digital computer systems. Proofs by induction, construction, contradiction, and reduction are used to formalize computability theory and the limitations of computing.

### Course Prerequisites

CS 120 and either Math 215 or Math 223

### Textbook

*Introduction to the Theory of Computation, Third Edition* by Michael Sipser.

Reading assignments will be posted on the course web site.

### Course Outline

The exact schedule of the course will depend on our rate of progress through the material. Below is an outline of topics, in the order that we will cover them.

- Math review
- Regular languages
- Context-free Languages
- Turing machines
- Decidability
- Reducibility
- Time complexity

- Space complexity

## Assignments and Exams

Your grade will be calculated based on the following items:

- **Attendance and Quizzes** – At the beginning of each class session I will pose at least one question to the class using plickers. Each class session will be worth one point, plus one point for each question that has an answer that I expect you to know. This will serve as both an attendance taking mechanism and as a way to give small quizzes.

You will not be able to make up plicker points. If you provide a valid reason why you cannot make it to class I will exclude that day's plicker points from your grade. To have your plicker points excluded you must notify me *before* class.

If you lose your plicker card or forget to bring it to class, you will not earn any plicker points for that day. Let me know if you lose your card so that I can get you a replacement.

- **Homework** – Homework will be assigned regularly throughout the semester. Homeworks will consist of written exercises, reading responses, small programming tasks, and JFLAP assignments. Each homework will typically be due the class period after it is assigned.

I will collect hard copies of written exercises. Programming assignments, writing assignments, and JFLAP assignments will be submitted through Moodle.

- **Projects** – These assignments will be more involved than the homework assignments, and you will be given more time to complete them. Completion time and grading will vary from project to project.

There will be a final project which will involve a presentation.

- **Exams** – There will be 2 exams in class throughout the semester. They are tentatively scheduled for September 25 and November 13. You may only re-schedule an exam for college approved absences or a documented illness. In either case you must contact me *before* the beginning of the exam.

## Grading

Grades will be weighted as follows:

- 10% Attendance and Quizzes
- 45% Homework and Smaller Projects
- 30% Exams (2 @ 15% each)
- 15% Final Project and Presentation

I will use the standard 90, 80, 70, 60 grading scale with pluses and minuses. I may relax these standards as necessary but I will not raise them.

## Communication

Feel free to talk to me about any issues that may arise. Contacting me via email is fine for general questions, but if you have specific questions about something that might lead to a back and forth

conversation, I would prefer that you communicate with me over direct message in the class Slack workspace.

If you are struggling with the material, it is generally more effective to talk in person. You are most likely to find me in my office during office hours, but I will be around other times as well. Don't be shy about stopping by or emailing me to set up an appointment.

## Course Policies

- **Assignment Submission** – Please submit assignments in the manner that I ask for. If I ask for a hard copy, bring a hard copy to class rather than emailing me a document.
- **Late Policy** – I will do my best to grade and return assignments to you as soon as I can. Late submissions make timely grading much more difficult. As such, any submissions I receive after I have started grading an assignment will be subject to a 25% penalty for each day that it is late, starting as soon as I start grading the assignment.

If an assignment's due date has passed and I want to start grading submissions but *nobody* has submitted, the 25% penalty starts at that point regardless of the fact that there is nothing to grade.

Exceptions to this policy will be granted in special circumstances. You must let me know *before* the due date if you feel you have a valid reason why you cannot turn an assignment in on time.

- **Extensions** – I will extend an assignment's due date for the entire class if it is clear that the original time frame was unreasonable. If you are going to bring up the possibility of a due date extension for a programming project, be prepared to demonstrate that you have already made substantial progress on the project.

I will grant personal extensions under the right circumstances. If you would like an extension for personal reasons, send me an email or come see me in my office.

- **Absences** – You are expected to attend each class, but I understand that occasionally there may be exceptional circumstances. If you miss a class or know that you will miss an upcoming class, please contact me as soon as possible to explain the situation. You will still be expected to keep up with assignments and class content.
- **Academic Honesty** – You are encouraged to discuss homework assignments and programming projects with other students. However, any uncited work you turn in must be your own.

Software similarity is a tricky thing as some similarities between code submissions are inevitable. I draw the line at submissions that contain a significant amount of code that is either identical to someone else's code or submissions where the only differences are purely cosmetic (i.e. variable and function names have been changed to hide code copying). If in doubt, put a comment in your code citing a source or acknowledging collaboration. Contact me if you have any doubts about what is permissible.

Dishonesty in any of your academic work is a serious breach of the Code of Academic Integrity and is grounds for an F for the entire course. Such violations include turning in another person's work as your own, copying from any source without proper citation, crossing the

boundary of what is allowed in a group project, submitting an assignment produced for a course to a second course without the authorization of all the instructors, and lying in connection with your academic work. You will be held responsible for your actions.

You are expected to know and abide by the rules and policies of the institution as described in the documents available here:

<https://www.wooster.edu/offices/academic-affairs/policies/>

- **Conflicts with Academic Responsibilities** – The College of Wooster is an academic institution and its fundamental purpose is to stimulate its students to reach the highest standard of intellectual achievement. As an academic institution with this purpose, the College expects students to give the highest priority to their academic responsibilities. When conflicts arise between academic commitments and complementary programs (including athletic, cultural, educational, and volunteer activities), students, faculty, staff, and administrators all share the responsibility of minimizing and resolving them.

As a student you have the responsibility to inform the faculty member of potential conflicts as soon as you are aware of them, and to discuss and work with the faculty member to identify alternative ways to fulfill your academic commitments without sacrificing the academic integrity and rigor of the course.

- **Recording Classroom Activities** – No student may record or tape or photograph any classroom activity without the express written consent of the course instructor.

## The Learning Center: Academic Support and Disabilities

The Learning Center, which is in APEX (Gault library) offers a variety of academic support services, programs and 1:1 meetings available to all students. Popular areas of support include time management techniques, class preparation tips and test taking strategies. In addition, the Learning Center coordinates peer-tutoring for several academic departments. Students are encouraged to schedule an appointment at the APEX front desk or visit the Learning Center Website for additional options.

An additional support that the Learning Center offers is English Language Learning. Students can receive instruction or support with English grammar, sentence structure, writing, reading comprehension, reading speed, vocabulary, listening comprehension, speaking fluency, pronunciation, and American culture through 1:1 meetings with the Learning Center staff, ELL Peer Tutoring, ELL Writing Studio courses, and other programming offered throughout the year. Students seeking ELL support are encouraged to visit the APEX front desk.

The Learning Center also coordinates accommodations for students with diagnosed disabilities. At the beginning of the semester, students should contact the Learning Center (ext. 2595) to make arrangements for securing appropriate accommodations. Although the Learning Center will notify professors of students with documented disabilities and the approved accommodations, students are encouraged to speak with professors during the first week of each semester. If a student does not request accommodations or does not provide documentation to the Learning Center, faculty are under no obligation to provide accommodations.

## **Title IX Reporting Policy**

The College of Wooster is committed to fostering a campus community based on respect and nonviolence. In accordance with Title IX, Wooster is legally obligated to investigate incidents of sexual harassment and sexual assault that occur on our campus. Faculty who become aware of any incident of sexual violence, including harassment, rape, sexual assault, relationship violence, or stalking, are required by law to notify Wooster's Title IX Coordinator. For more information about your rights and reporting options at Wooster, including confidential and anonymous reporting options, please visit <http://www.wooster.edu/offices/title-ix/>.

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The details of this syllabus are subject to change based on our progress through the material.