

Course Syllabus

CS 3531: Theory of Automata and Formal Languages, Spring 2020

Course Description: Introduction to the theory of computation. Deterministic and nondeterministic finite automata, regular languages and regular expressions. Kleene's Theorem. Context-free languages, context-free grammars and pushdown automata. Turing machines and computability.

Prerequisites: CS 2531 or MATH 3355 with a grade of C- or better

Meeting Time and Place:

Monday	11:00 – 11:50	Humanities 403
Tuesday	11:00 – 12:15	Humanities 403
Thursday	11:00 – 12:15	Humanities 403

Student Learning Outcomes:

1. Identify different formal language classes and their relationships
2. Learn and use structural induction
3. Work with models of computing and understand their different powers
4. Understand and formulate regular expressions
5. Understand and formulate context-free grammars
6. Be familiar with Turing machines and computability

Instructor: Dr. Andrew Sutton, 311 Heller Hall, phone: (218) 726-7978, email: amsutton@d.umn.edu, Office Hours: Tu/Th 9:15-10:45

Teaching Assistant: Tony Madison, email: madis179@d.umn.edu, Office Hours: W 15:00-17:00, Tu 13:00-14:30. Location: 314 Heller Hall

Required Textbook: *Introduction to the Theory of Computation* by Michael Sipser. Any edition is acceptable. It is important that you have access to the textbook because the instructor will only provide notes on material not covered by the book.

Assessment Components:

Homework (30%). There will be a homework assignment roughly every week. Each week's assignment will be distributed on Monday and due in class at the beginning of the following Monday's class. Late homework will be deducted 20% and accepted until the beginning of Tuesday's class. Homework will not be accepted more than 24 hours late. This will allow an in-class discussion of homework solutions.

Participation (10%). We will often have collaborative in-class problem solving sessions. Each class period I will record who participates in these sessions. To receive full credit students must participate during ten different class periods. It is not necessary to give correct answers to receive participation credit, only to make a serious attempt to solve a problem.

Midterm Examinations (30%). There will be two midterm examinations, in approximately weeks five and ten of the course. The dates of the midterms will be announced at least one week beforehand.

Cumulative Final Examination (30 %). The final exam will take place during finals week. The date, time and location will be announced beforehand. Please confirm the time and location before the exam, as the schedule may change. The final exam policy can be found here: <https://www.d.umn.edu/evcaa/academic-policies/final-examinations>.

Timetable: Below is a tentative timetable for the semester.

Week	Topic	Reading
1	Syllabus, policies, review of material from CS 2531, and background material	
2	Regular languages and finite automata	1.1 and 1.2
3	Regular Expressions	1.3
4	Nonregular languages and the pumping lemma	1.4
5	Wrap up of regular languages, review, Midterm Exam 1	
6	Context-free grammars	2.1
7	Chomsky normal form	2.1
8	Pushdown automata	2.2
9	Non-context free languages and the pumping lemma	2.3
10	Wrap up context free languages, review, Midterm Exam 2	
11	Turing machines	3.1 and 3.2
12	Decidability	4.1
13	Undecidability	4.2
14	Reducibility	Chapter 5
15	Wrap up computability theory, review	
16	Final Exam	

Exams: There will be two midterms, each worth 15% of the course grade, and a cumulative final exam worth 30% of the final grade. Exams are closed-book and closed-notes. No electronic devices will be allowed. Exams will not be given early, and makeups must be justified by dire circumstances described to the instructor *before* the time of the exam. It is departmental policy not to return final exams. However, they will be filed in the instructor's office, and you may request to see them.

Course Management System Grades and some course documents, such as an up-to-date copy this syllabus and a schedule updated weekly, will be available through Canvas. **There will not be comprehensive course notes or slides available on Canvas.** For this reason, students should have the textbook and take notes during lectures.

Exam	Material	Date
Midterm 1	Chapter 1	Thursday, Feb 20
Midterm 2	Chapter 2, 2.1–2.3	TBA (week 10 or 11)
Final	Chapters 1–5	TBA (week 16)

Academic Policies:

Absence. Students are expected to attend all scheduled class meetings. It is the responsibility of students to plan their schedules to avoid excessive conflict with course requirements. However, there are legitimate and verifiable circumstances that lead to excused student absence from the classroom such as subpoenas, jury duty, military duty, religious observances, illness, bereavement, and NCAA varsity intercollegiate athletics. Find complete information here: <https://www.d.umn.edu/evcaa/academic-policies/excused-absences>.

It will be difficult to complete the assignments if you miss class. If you are unable to attend a class meeting, it is your responsibility to obtain class notes and other materials from other students in the class. There are no makeups for missed exams unless you have an excused absence that qualifies under the official Excused Absence Policy linked above.

Student Conduct Code. Appropriate classroom conduct promotes an environment of academic achievement and integrity. Disruptive classroom behavior that substantially or repeatedly interrupts either the instructor's ability to teach, or student learning, is prohibited. Disruptive behavior includes inappropriate use of technology in the classroom. Examples include ringing cell phones, text-messaging, watching videos, playing computer games, doing email, or surfing the Internet on your computer instead of note-taking or other instructor-sanctioned activities. Student are expected adhere to the Board of Regents Policy: https://regents.umn.edu/sites/regents.umn.edu/files/policies/Student_Conduct_Code.pdf

Teaching & Learning. Instructor and Student Responsibilities: UMD is committed to providing a positive, safe, and inclusive place for all who study and work here. Instructors and students have mutual responsibility to insure that the environment in all of these settings supports teaching and learning, is respectful of the rights and freedoms of all members, and promotes a civil and open exchange of ideas. Reference the full policy here: <https://www.d.umn.edu/evcaa/academic-policies/instructor-and-student-responsibilities>

Group Work. All work submitted on homework and exams must be entirely your own. Group work is valuable for learning, and working on homework assignments in groups is encouraged, but you must write and understand your own individual solutions. You are welcome to work on the homework assignments in groups, but you should write your solutions alone to be sure that you understand them. You must be able to explain all your submitted solutions to the professor or the TA if asked. If you are unable to complete homework assignments on your own, you will have difficulty succeeding on the exams.

Extra Credit. There is no extra credit work available beyond that listed in the syllabus and course calendar.

Academic Integrity. Academic dishonesty is taken seriously by the University. Cheating on assignments or examinations, plagiarizing, or any other act which violates the rights of another student in academic work or that involves misrepresentation of your own work may result in a grade reduction on the assignment/quiz/test or a grade reduction in the class (including the possibility of failing the class). If a student is found responsible for academic dishonesty, a report is filed with the UMD student academic integrity officer and is considered a violation of the Student Conduct Code. The UMD Student Academic Integrity Policy can be found at: <https://www.d.umn.edu/evcaa/academic-policies/student-academic-integrity>. The policy outlines what is considered prohibited conduct.

Final Exams. All 1xxx-5xxx courses offered for undergraduate credit should include a final graded component or end of term evaluation that assesses the level of student achievement of one or more course objectives. All final graded components are to be administered or due at the time and place according to the final exam schedule and not during the last week of class. Reference the full policy here: <https://www.d.umn.edu/evcaa/academic-policies/final-examinations>

Appropriate Student Use of Class Notes and Course Materials. Taking notes is a means of recording information but more importantly of personally absorbing and integrating the educational experience. However, broadly disseminating class notes beyond the classroom community or accepting compensation for taking and distributing classroom notes undermines instructor interests in their intellectual work product while not substantially furthering instructor and student interests in effective learning. Find additional information here: <https://www.d.umn.edu/evcaa/academic-policies/course-notes-and-materials>.

Students with Disabilities. It is the policy and practice of the University of Minnesota Duluth to create inclusive learning environments for all students, including students with disabilities. If there are aspects of this course that result in barriers to your inclusion or your ability to meet course requirements such as time limited exams, inaccessible web content, or the use of non-captioned videos, please notify the instructor as soon as possible. You are also encouraged to contact the Office of Disability Resources to discuss and arrange reasonable accommodations. Call 218-726-6130 or visit the Disability Resources web site at <https://umd-general.umn.edu/disability-resources> for more information.

<p><i>The instructor reserves the right to make changes to this syllabus or the course calendar at any time, and without prior notice.</i></p>
--