Syllabus

CS 420: Introduction to the Theory of Computation

Tiago Cogumbreiro
`tiago.cogumbreiro@umb.edu`
Office: M03-0201-16, 3rd floor, McCormack

Fall 2022

Course information

Room: (Y01-1350) 1350, 1st floor, University Hall

Schedule: Monday, Wednesday from 4:00PM – 5:15PM

Course description

Introduction to theoretical aspects of computing including models of computation, inherent limits on computation, and feasible computation. Topics covered:

- finite automata (deterministic, nondeterministic, pushdown)

- regular expressions

- context-free grammars

- decidability

- computable functions (recursive functions, functions computable by Turing machines, functions computable in a programming language)

- insolvability of the halting problem and related problems

Prerequisites

CS 220/CS 320L (Applied Discrete Mathematics) or permission from the instructor.

Required textbooks

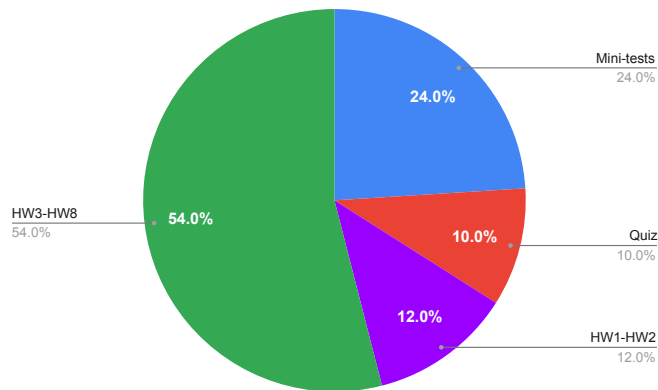- Logical Foundations, Version 5.6, by Benjamin C. Pierce, *et al.*
  URL: `https://softwarefoundations.cis.upenn.edu/lf-current/`

Figure 1: Visualization of assignment distribution.

Supplementary material

- Introduction to the Theory of Computation, 3$^{\text{rd}}$ edition, by Michael Sipser. ISBN: 113318779X

- CS420 Spring 2019, Prof. Peter Fejer, University of Massachusets Boston. URL: `https://www.cs.umb.edu/~fejer/cs420/`

- CSCI3130 Fall 2018, Prof. Siu On Chan, The Chinese University of Hong Kong.
  URL: `https://www.cse.cuhk.edu.hk/~siuon/csci3130-f18/`

- Theory of Computation video course, Prof. Harry H. Porter III. URL: `http://web.cecs.pdx.edu/~harry/videos/`
  YouTube mirror: `https://tinyurl.com/y3j6kq9z`

Course work and grades

No courses required by the CS major, minor, or certificate may be taken pass/fail. The final grade is obtained according to table 1. Find a visualization of the grade distribution in fig. 1. Course work includes:

- a mini-test at the end of each module (4 in total)

- a lecture quiz at the end of each lecture – although some lectures will not have a quiz.

- 8 homework assignments

- 0 exams

Mini-Test 1	6			
Mini-Test 2	6			
Mini-Test 3	6	$95 \le P$	A
Mini-Test 4	6	$90 \le P < 95$	A-
Quizzes	10	$85 \le P < 90$	B+
HW1	6	$80 \le P < 85$	B
HW2	6	$75 \le P < 80$	B-
HW3	9	$70 \le P < 75$	C+
HW4	9	$60 \le P < 70$	C
HW5	9	$55 \le P < 60$	C-
HW6	9	$50 \le P < 55$	D+
HW7	9	$45 \le P < 50$	D
HW8	9	$40 \le P < 45$	D-
Total	**100**	$P < 40$	F

(a) Final grade in points.   (b) From points to a letter grade.

Table 1: Final grade calculation.

Final grade adjustments. The decimal points of your final grade will be truncated (not rounded up). For instance, a final grade of 69.99 yields a C+, **not** a B-.

- If there are fewer than 6 homework assignments with less than 35 points, your **final grade** is at most 34 points.

- If there are fewer than 6 homework assignments with less than 50 points, your **final grade** is at most 49 points.

- If there are fewer than 6 homework assignments with less than 70 points, your **final grade** is at most 69 points.

Mini-Tests

The homework grade will be a (possibly weighted) average of at most 4 mini-tests. Mini-tests may be graded on a curve. Each mini-test is made available via Gradescope and can be submitted during a 24 hour window.

Quizzes

After each lecture you will be given at most one quiz to solve within 24 hours. The final grade of quizzes is graded on a curve and takes into account all quizzes. Quizzes will be made available via Blackboard.

Homework assignments

The homework grade will be a (possibly weighted) average of at most 10 homework assignments.

- The final grade of each assignment is given by the *instructor*, regardless of what the grading software shows.

- **The instructor/TA can schedule an interview, outside of lecture hours, to test your knowledge of any homework assignment you submit**; points can be deducted as a result of the interview.

- Assignments may be deducted points for code style.

- No late homework will be accepted. The reception of assignments is done automatically.

- You may **not** collaborate with anyone else on any homework. Each homework represents your own, individual work.

- It is *acceptable* to discuss the concept in general terms, but *unacceptable* to discuss specific solutions to any homework assignment.

- Homework assignments will be automatically scanned for plagiarism against the present year and all past years of this course.

Incomplete grade policy

We consider a **portion the required class work** to be *at most* 20% of the total work, as per the incomplete policy.[1]

Here is an excerpt from the school's incomplete policy:

> The grade incomplete (INC) is reported only where a portion of the assigned or required class work, or the final examination, has not been completed because of serious illness, extreme personal circumstances, or scholarly reasons at the request of the instructor. If your record is such that you would fail the course regardless of your missing work, you will fail.

Software requirements

Students are expected to have access to Coq 8.13.2. Homework assignments consist of a Coq script and possibly a paper that will be submitted to Gradescope (unless stated otherwise).

Attendance

Attendance is encouraged. In case of a student not being able to attend a class, the student should contact the instructor as soon as possible. Students are responsible for knowing everything that is covered during class meetings, including announcements. If you must be absent from a class meeting, make arrangements with another student to find out what you missed.

---

[1]`https://www.umb.edu/registrar/academic_policies/incomplete_policy`

Accommodations

This class seeks ways to become a working and evolving model of inclusion and universal design for all participants. Individuals with disabilities of any kind (including learning disabilities, ADHD, depression, health conditions), who require instructional, curricular, or test accommodations are responsible for make such needs known to the instructor as early as possible. Every effort will be made to accommodate students in a timely and confidential manner. Individuals who request accommodations must be registered with the Ross Center for Disability Services, which authorizes accommodations for students with disabilities. If applicable, students may obtain adaptation recommendations from the Ross Center for Disability Services,[2] M-1-401, (617-287-7430). The student must present these recommendations and discuss them with each professor within a reasonable period, preferably by the end of Drop/Add period.

Student Conduct

Students are required to adhere to the University Policy on Academic Standards and Cheating, to the University Statement on Plagiarism and the Documentation of Written Work, and to the Code of Student Conduct as delineated in the catalog of Undergraduate Programs, pp. 44-45, and 48-52. The Code is available online.[3]

---

[2]`https://www.rosscenter.umb.edu`
[3]`https://www.umb.edu/life_on_campus/dean_of_students/student_conduct`