Syllabus

CS 420: Introduction to the Theory of Computation

Spring 2020

Course information

Room: M01-0207, McCormack

Schedule: 4:00pm to 5:15pm, Monday, Wednesday, Friday

Instructor

Contact: Tiago Cogumbreiro, `tiago.cogumbreiro@umb.edu`

Office: M03-0201-16, 3rd floor, McCormack

Office hours: 1:00pm to 2:00pm, Monday, Wednesday, Friday

Course description

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

Prerequisites

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

Textbooks

- Introduction to the Theory of Computation, 3rd edition, by Michael Sipser. ISBN: 113318779X
- Logical Foundations, Version 5.6, by Benjamin C. Pierce, *et al.* URL: `https://softwarefoundations.cis.upenn.edu/lf-current/`

Supplementary material

- 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`

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

Course work and grades

Warning: No courses required by the CS major, minor, or certificate may be taken pass/fail.

There will be no exams.

- Mini-Tests: 26%
- Homework: 70%
- Participation: 4%

If P is the final percentage of your homework and participation, then your course grade will be calculated as follows, where decimal points are discarded. For instance, a final grade of 69.99 yields a `C+`, **not** a `B-`.

$95 \leq P$	A
$90 \leq P < 95$	A-
$85 \leq P < 90$	B+
$75 \leq P < 85$	B
$70 \leq P < 75$	B-
$65 \leq P < 70$	C+
$55 \leq P < 65$	C
$50 \leq P < 55$	C-
$45 \leq P < 50$	D+
$35 \leq P < 45$	D
$30 \leq P < 35$	D-
$30 \leq P$	F

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 8.8. Homework assignments consist of a Coq script and possibly a paper that will be submitted to Gradescope (unless stated otherwise).

Attendance

Attendance is required and counts toward participation. 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`

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. Every mini-test is done during classroom time and has the duration of at most 40 minutes.

Homework

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

- 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.

Participation

The participation component consists of:

- attendance
- in-class quizzes
- participation in the classroom
- participation in the online forum

Participation does not just mean just answering questions correctly. Discussion and questions, either posed online or in class, are encouraged and counted toward participation.

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.

sectionStudent 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