CSC 463: Computational Complexity and Computability  
Winter 2020

Instructor: Adrian She  
Teaching Assistants: Gregory Rosenthal, Pouya Shati  
Lectures: MWF 2-3pm in GB 221  
Office Hours: Tuesday 3-4pm in BA2283, or by appointment  
Course Email: csc463-2020-01@cs.toronto.edu

Course Contents and Objectives: By the end of the course students should be able to

- Define various complexity classes (eg. decidable problems, NP, PSPACE, NL), and prove properties about these classes and problems belonging to them.
- Gain an appreciation for theoretical computer science and understand its connections to other subfields within computer science, mathematics, and other sciences.

Specifically the course content will include:

- Computability Theory (5 weeks): Turing machines, Church’s Thesis, decidability and semi-decidability, diagonal arguments, the Halting Problem and other undecidable problems, reductions, complete problems.
- Computational Complexity (7 weeks): The classes P and NP, polynomial time reducibility, NP-completeness, Cook-Levin Theorem, various NP-complete problems, space complexity (NL and PSPACE), intractable problems, other topics.

Course Materials: The recommended course textbook is Michael Sipser, “Introduction to the Theory of Computation”, 2nd or 3rd edition. The course contents will correspond to parts of Chapter 3-10 of this textbook (in either edition).

Supplementary notes for some topics will be posted on the course Quercus page. Problem sets and class announcements will also be posted on the course Quercus page.

A course Piazza will also be made available for discussions about course material. Please use Piazza rather than email for help related to understanding the course material.

References: These books may be useful to students seeking additional reading about the course topics.


Marking Scheme: Your course mark will be based on 4 assignments (10% each, tentatively due Jan 31, Feb 14, Mar 13, Mar 27), a midterm exam (20%, Feb 26), and a final exam (40%, date TBD).

Homework and Accommodation Policy: You may discuss homework problems with each other; however, you should prepare written solutions alone. Copying assignments is a serious academic offense and will be dealt with accordingly.

Students with diverse learning styles and needs are welcome in this course. In particular, if you have considerations that may require accommodations, please feel free to approach the instructor by email and/or Accessibility Services at (416) 978 8060; studentlife.utoronto.ca/as.

Course Tutorials: The Friday lecture will often be used for a course tutorial lead by the teaching assistants. The course tutorial may include practice with solving problems related to the course material and/or help with the course assignments. You are encouraged participate actively in course tutorials to support your learning in the course.