CSC236H1F: Introduction to the Theory of Computation

Contact Information

Instructors: Bahar Aameri
Email: csc236-2019-09@cs.toronto.edu
Office Hours: *Mon. 1:30-3:30pm, Thu.3-5pm, BA2283*

Lectures Time and Location:
L0101: MW 11am-12pm, WI 1016
L0201: MW 12pm-1pm, WI 1016
L0501: Th 6pm - 8pm, BA1160

Tutorials Time and Location:
L0101: F 11am-12pm, TBA
L0201: F 12pm-1pm, TBA
L0501: Th 8pm - 9pm, TBA

Course website: Quercus-portal
All course material, including lecture slides, will be posted on the website.

All announcements will be made through portal (Quercus) and/or course discussion board, and it is your responsibility to check them regularly.

Course Overview

Outline The course will cover the following subjects:

- Proof by Simple, Complete, and Structural Induction, Well-ordering Principle.
- Algorithm Correctness.
- Regular Languages, Finite-State Automata, Regular Expression.
- Time Complexity of Recursive Algorithms, Recurrence Relations.
- Divide-and-Conquer Algorithms.

Prerequisite CSC148, CSC165

Tutorials There will be 11 tutorial sessions. During each tutorial session, students will work on a set of exercises. Exercises for each session will be posted on the course web page a few days before the session. Students are expected to work on the exercises *before* the tutorial and be prepared to correct and/or complete their solutions with the help of the TA.
Out of 11 tutorial exercises, 5 exercises *are parts of the course evaluation.* The solutions to those exercises must be submitted to the TAs at the end of the tutorial sessions (see section on Evaluation for the dates). During those sessions, students MUST work in groups of *two,* and each group must submit *one* solution.

Textbook Course Notes for CSC B36/236/240, Copyright 1998, 2007 by Vassos Hadzilacos (Free PDF available on Blackboard portal). Note that we will *not* follow these notes to the letter.

Additional Reference K.H. Rosen: *Discrete Mathematics and Its Applications*, 7th Ed. (2011), McGraw-Hill Science.

How to do well in this course The key to mastering any subject, especially in theoretical subjects, is to *comprehend* the concepts of the subject, and *practice* applying the concepts.

Throughout the course, we provide as much practice as possible. However, depending on your mathematical background, you might need to do extra exercises that are not part of the course work. The following are hence necessary for doing well in the course, but might not be sufficient:

- Attend the *lectures* and *tutorials*, *ask* questions, *participate* in class discussions, and go to *officer hours*.
- Work on the given exercises *before* the tutorials, show your solutions to the TA, and ask for *feedback*.
- Spend 8-10 hours/week:
    - 2 hours in lectures
    - 1 hour in tutorial
    - 5-7 hours reviewing slides and course notes, working on exercises and assignments.
- Check the course web page and emails *regularly*, pay attention to the course *instructions*, *policies*, *announcements* and *deadlines*.

Evaluation

Summary The following table summarizes the course-work percentages and due dates

Item	***Due Dates***	***Weight***
Exercise #1	Week of Sep 16, in Tutorial	1%
Exercise #2	Week of Sep 30, in Tutorial	1%
Exercise #3	Week of Oct 14, in Tutorial	1%
Exercise #4	Week of Oct 28, in Tutorial	1%
Exercise #5	Week of Nov 18, in Tutorial	1%
Assignment #1	Oct 13, 11pm	10%
Assignment #2	Nov 11, 11pm	10%
Assignment #3	Dec 05, 11pm	10%
Term Test	Sometime between Oct 17 to Oct 24, exact date TBD (IMPORTANT: read the instructions below)	20%
Final Exam	TBD	45%

Details

- ***3 Assignments***: worth 30% in total.
  Assignments are to be completed in groups of no more than **two** students.
  Assignments will be posted on portal, *at least two weeks* before the due dates. Start working on them *early*, so that you have an estimate of how much time you need to complete them, and to identify the parts that you need clarification and/or help with.
  Assignment solutions will *not* be discussed during the lectures and tutorials, but will be posted on the course web page *within one week* after the due dates.
  See the "Policies and Other Instructions" section for information about assignment submission, late submission policy, and remark requests.

- ***5 Exercises***: worth *5%* in total.
  Exercises must be submitted to the TAs at the end of the tutorial sessions. Students MUST work in groups of *two*, and each group must submit *one* solution.

- ***Mid-Term Test***: You will be allowed to bring one *single-sided handwritten* 8.5"x11" aid sheet.
  IMPORTANT: If you are unable to attend the term test due to schedule conflicts, send a request for writing the make-up test to csc236-2019-09@cs.toronto.edu. In your request, explain why you cannot attend the test during the scheduled time and include **supporting documents** (e.g, screenshots of your weekly schedule that shows **your name**). The **deadline** for requesting the make-up test is **two weeks after the exact date of the term test is announced.** The ***Make-up*** test will be on **the same date** as the regular test, but on a different time. **IMPORTANT:** If your request for the make-up test is not approved ahead of the term test, you will **not be permitted** to write the make-up test, and will receive zero for the term test.
- ***Final Exam***: The final exam is *3 hours* and will cover *all* the topics discussed in the course. In order to pass the course, students must obtain **at least 35%** on the final exam.
  You will be allowed to bring one double-sided handwritten 8.5"x11" aid sheet.

Policies and Other Instructions

Assignments Submission Submissions must be *typed* and submitted as PDF files on MarkUs.

Re-marking Requests If you feel a piece of your work has been graded unfairly, please submit a written request within *one week* of receiving the work back. Explain your request clearly and briefly, and attach the work in question. All requests must be submitted to the *instructor*. Remark request for *assignments* must be submitted through MarkUs.

Late Work Late assignments will be penalized by *2%* for every *hour* of lateness up to *24 hours* after the due date, except for valid and *documented* reasons. Documents for justifying late or missed work must be submitted to the *instructor* as soon as possible. If you have a valid document for a missed *assignment/exercise*, the marks associated to the assignment/exercise will be reweighed to *other* assignments/exercises. If you miss the *term test* and have a valid document, the marks associated to the test will be reweighed to the *final exam*.

Discussion Board *General* questions about the course organization, material, and assignments should be posted on the discussion board (https://piazza.com/utoronto.ca/fall2019/csc236h1).
The discussion board will be monitored by the instructor and TAs, but can also be used for discussion among students. You may NOT discuss the assignment solutions on the board until *the sample solutions are posted.*

Email Policy Please use your *university email address* and put the *course code* in the subject line of your emails. Use email only for *personal issues* such as requesting special considerations. Compose a short message and clearly describe a single topic. Email response time may be 24 hours or longer; if you do not hear back as your expectation, come to the weekly office hours.

Academic Integrity Academic integrity is a fundamental principle in higher education. Any breach of academic honesty is a serious academic offence which eventually can affect one's professional life dramatically. Suspected cases of academic dishonesty will be investigated based on the University's Integrity Policies, with no exception.
When discussing assignment problems with other groups, do NOT take any notes (paper or electronic) from the discussions. Your submissions must be developed and written solely based on *your own interpretation* of group discussions, otherwise it will be considered as plagiarism. For details on the meaning of plagiarism and how it can be avoided read this document.

Tentative Schedule

Week	*Topic*	*Readings From the Text Book*	*Important Dates*
1	Introduction, Simple & Complete Induction	Sections 1.1, 1.2, 1.3	
2	Complete Induction, Well-ordering, Recursively Defined Sets	Sections 1.3, 4.1	
3	Structural Induction, Regular Languages	Chapter 4, Section 7.1	E1 due
4	Deterministic Finite State Automata (DFA)	Sections 7.3	
5	Regular Expressions, Nondeterministic Finite State Automata	Sections 7.2, 7.4	E2 due
6	Equivalence of regular expressions and FSA, Closure properties of regular languages	Sections 7.5, 7.6	A1 due
7	Proving Non-regularity, Program Correctness	Sections 7.7, 2.1, 2.2	E3 due Term test
8	Program Correctness (recursive programs)	Sections 2.7, 2.8	
9	Reading Week		
10	Program Correctness (iterative programs)	Sections 2.3, 2.4, 2.5, 2.6	E4 due A2 due
11	Recursively Defined Function, Program Complexity, Master Theorem	Section 3.1, 3.2	
12	Complexity, Divide-and-Conquer Algorithms	Sections 3.3	E5 due
13	Review		A3 due