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:
- 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.


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

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

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](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.
<table>
<thead>
<tr>
<th>Week</th>
<th>Topic</th>
<th>Readings From the Text Book</th>
<th>Important Dates</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Introduction, Simple &amp; Complete Induction</td>
<td>Sections 1.1, 1.2, 1.3</td>
<td></td>
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<tr>
<td>2</td>
<td>Complete Induction, Well-ordering, Recursively Defined Sets</td>
<td>Sections 1.3, 4.1</td>
<td></td>
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<tr>
<td>3</td>
<td>Structural Induction, Regular Languages</td>
<td>Chapter 4, Section 7.1</td>
<td>E1 due</td>
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<tr>
<td>4</td>
<td>Deterministic Finite State Automata (DFA)</td>
<td>Sections 7.3</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Regular Expressions, Nondeterministic Finite State Automata</td>
<td>Sections 7.2, 7.4</td>
<td>E2 due</td>
</tr>
<tr>
<td>6</td>
<td>Equivalence of regular expressions and FSA, Closure properties of regular languages</td>
<td>Sections 7.5, 7.6</td>
<td>A1 due</td>
</tr>
</tbody>
</table>
| 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 |