CSI 3104 Introduction to Formal Languages

(3 hours of lecture per week, 3 credits)

Winter 2020
Course Outline

Regular languages, finite automata, transition graphs, Kleene's theorem. Finite automata with output. Context-free languages, derivation trees, normal form grammars, pumping lemma, push-down automata, determinism. Decidability. Recursively enumerable languages, Turing machines, the halting problem. Prerequisites: CSI2101 or MAT2143.

Course Objectives:

- To study mathematical models of today's computers, called *machines*.
- To understand the power and limitations of these machines by analyzing the types of inputs, called *languages*, on which they operate successfully.
- To investigate problems and their potential solutions as *algorithms* by analyzing the interplay between languages and machines.
- To acquire a good understanding of the three main components of the theory of computers and computation: automata, context-free languages, and Turing machines. Each component will include the study of a type of machine and a corresponding set of languages.

Professor:

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Correctors:

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Lectures:

- Taberet Hall (TBT), Room 070
- Monday 11:30-12:50
- Thursday 13:00-14:20

Office Hours: Thursday, 9:30-11:30

Textbook: *Introduction to Computer Theory*, Daniel Cohen, Wiley, 2nd edition, 1997. Available at the university bookstore.

Course Web Page: `http://www.eecs.uottawa.ca/~afelty/courses/csi3104/`

Evaluation: Your final mark with be determined by one of the following two formulas, whichever gives you a higher mark:

Assignments	25%	
Midterm	25%	
Final Exam	50%	

OR

Assignments	30%	
Midterm	20%	
Final Exam	35%	
Float	15%	(added to your midterm mark or your final mark, whichever is higher)

- There will be approximately 7 or 8 assignments.
- Assignments must be done individually.
- Assignments must be submitted in one of the following 2 ways:
  - Assignments can be submitted on Virtual Campus.
  - Assignments can be handed in to the CSI3104 assignment box.

Approximate Course Outline:

- Introduction, Languages, Recursive Definitions, Chapters 1, 2, 3
- Regular Expressions, Chapter 4
- Finite Automata, Transition Graphs, Chapters 5, 6
- Kleene's Theorem, Nondeterministic Finite Automata, Chapter 7
- Finite Automata with Output, Regular Languages, Chapters 8, 9
- Nonregular Languages, Decidability, Chapters 10 (pages 187–196), 11
- Context-Free Grammars, Grammatical Format, Chapters 12, 13
- Pushdown Automata, Context-Free Grammars = Pushdown Automata, Chapters 14, 15 (pages 318–327)
- Non-Context-Free Languages, Context-Free Languages, Chapters 16, 17
- Decidability, Parsing, Turing Machines, Chapters 18 (pages 402–410 and 415–423), 19
- Recursively Enumerable Languages, Chapter 23

Reminders:

- Attendance at lectures is mandatory. As per academic regulations, students who do not attend 80% of the lectures will not be allowed to write the final examination.
- Cell-phones should be turned to silent.
- All components of the course (i.e., laboratory reports, assignments, etc.) must be fulfilled; otherwise students may receive an EIN as a final mark (equivalent to an F). This is also valid for a student who is taking the course for the second time.
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- Information on academic fraud can be found at this link: `https://www.uottawa.ca/vice-president-academic/academic-regulations-explained/academic-fraud`.
- Students are to become familiar with the Faculty of Engineering rules and regulations; you may refer to them if you happen to miss an exam. These are within the University of Ottawas regulations sections 9.4, 9.5, 9.6, 14.2 and 14.3, which define conduct during an examination, academic fraud, the sanctions and the decision and appeal processes: `https://www.uottawa.ca/administration-and-governance/policies-and-regulations`.
- Students are to familiarize themselves with the University of Ottawas policy on plagiarism (`http://web5.uottawa.ca/mcs-smc/academicintegrity/home.php`). This policy will be strictly enforced in this course.
- Important dates and deadlines for the academic year can be found at the following link: `http://www.registrar.uottawa.ca/Default.aspx?tabid=2671`.
- Several resources from the faculty of engineering can be found at the following link: `https://www.uottawa.ca/en/students`.
- Library resources for engineering students can be found at the following link: `http://biblio.uottawa.ca/en/research-help/research-guides-and-librarians`.
- If necessary, the instructor will contact students through their official University of Ottawas e-mail address (username@uottawa.ca). If you are using a personal e-mail address, please go to the university mail management web site to set a forwarding address (`https://web.uottawa.ca/cgi-bin/mailadmin/main.pl`). You are responsible for ensuring you are receiving official course information in an efficient and timely manner.

- The University of Ottawa provides, upon request, appropriate academic adjustments for students who have learning disabilities, health, psychiatric or physical conditions. For more information, please contact Access Service (`http://www.sass.uottawa.ca/access/`). The Student Academic Success Service provides many more services to help you succeed (`http://www.sass.uottawa.ca/about/our-services.php`).
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