



THE UNIVERSITY OF WINNIPEG

Applied Computer Science

Course Number – GACS-7401-003
Course Name – Topics in Formal Languages and Automata Theory

Instructor Information

Instructor:	J. Currie	Office:	3C17
E-mail:	j.currie@uwinnipeg.ca	Office Hours:	by appointment
Class Meeting Time:	TR 8:30 – 9:45	Room No:	3D03

Important Dates

1. First Class Date: Jan. 4, 2018
2. Midterm Exam: Feb. 15, 2018
3. Louis Riel Day (University closed): Feb. 19, 2018
4. Mid-term Reading Week (no classes): Feb. 19 – 23, 2018
5. Final Withdrawal Date w/o academic penalty: Mar. 14, 2018
6. Good Friday (University closed): Mar. 30, 2018
7. Final Exam (Comprehensive): Apr. 18, 2018, 9:00 – 12:00

Course Objectives/Learning Outcomes

Students will become familiar with concepts in the theory of formal language and automata, such as regular languages, context-free languages, Turing machines, the Chomsky hierarchy, parsing, combinatorics on words, Kolmogorov complexity, randomness, and the method of incompressibility. Students will be able to define various language classes and related automata, and prove membership/non-membership of certain words in certain classes. Students will be able to state and prove elementary results related to combinatorics on words (periodicity, repetitions, borders), and use Ogden's lemma, the method of incompressibility, etc., in examples.

Evaluation Criteria

1. Assignments (30%)

There will be 5 assignments, each worth 6%, due at the beginning of the last class in each of weeks 3, 5, 8, 10 and 12. Assignments will consist of problems from the text or as composed/edited by the instructor. Some assignments may involve programming. Assignments may be hand-written or typed; they may be submitted electronically by prior arrangement with the instructor. Late assignments will not be accepted.

2. Midterm Test (30%)

There will a 50 minute mid-term test in class, worth 30%. If the midterm is missed for accepted documented medical or compassionate reasons, the marks will be added to the final exam.

3. Final Exam (40%)

The 3-hour final exam will be worth 40%.

The grade distribution will be approximately as follows:

A+	93 – 100	A	85 – 92	A-	80 - 84
B+	75 – 79	B	69 – 74	C+	63 – 68
C	56 – 62	D	50 – 55	F	0 – 49

Final grades shall be approved by the Department Review Committee and may be subject to change.

Photo identification (e.g., student card) may be requested at each test/exam. Students who are not able to provide identification during the test will have one day to produce it. Tests will not be graded until assurance of identity is made.

Note that there will be **no make-up tests**. If you miss a test for a valid reason, you must provide written documentation in order to receive consideration.

Cell phones and other **electronic devices must be turned** off during classes, tests, final exam.

Department deferral policy: A student may ask the instructor for a deferred final exam on documented medical or compassionate grounds. It is department policy that the instructor not grant any such request based on the student's **vacation plans**. Notwithstanding this departmental policy, the student has the right to formally petition the Senate Student Appeals Committee for a deferred exam. The student must consult an Academic Advisor before filing a formal appeal.

Students with documented disabilities, temporary or chronic medical conditions, requiring academic accommodations for tests/exams (e.g., private space) or during lectures/laboratories (e.g., note-takers) are encouraged to contact Accessibility Services (AS) at 786-9771 or accessibilityservices@uwinnipeg.ca to discuss appropriate options. All information about a student's disability or medical condition remains confidential. See <http://www.uwinnipeg.ca/accessibility>.

Students facing a charge of academic or non-academic misconduct may choose to contact the University of Winnipeg Students' Association (UWSA) where a student advocate will be available to answer any questions about the process, help with building a case, and ensuring students have access to support. For more information or to schedule an appointment, visit www.theuwsa.ca/academic-advocacy or call [204-786-9780](tel:204-786-9780).

We ask that you please be respectful of the needs of classmates and instructors/professors by avoiding the use of unnecessary scented products while attending lectures. Exposure to scented products can trigger serious health reactions in persons with asthma, allergies, migraines or chemical sensitivities. Please consider using unscented necessary products and avoiding unnecessary products that are scented (e.g. perfume).

All students, faculty and staff have the right to participate, learn and work in an environment that is free of harassment and discrimination. The UW Respectful Working and Learning Environment Policy may be found online at www.uwinnipeg.ca/respect.

Required Text Book(s)/Reading List

The textbook is *A Second Course in Formal Languages and Automata Theory*, by Jeffrey Shallit, ISBN 978-0-521-86572-2

Misuse of Computer Facilities, Plagiarism, and Cheating

Academic dishonesty is a very serious offense and will be dealt with in accordance with the University's policies. Be sure that you have read and understood **Regulations & Policies #8** in the 2017-2018 UW Course Calendar.

Topics to be Covered (tentative)

Week	Topic	Text sections
1	Sets, strings, regular languages	1.1—1.3
2	Finite automata, context-free grammars and languages	1.4—1.5
3	Turing machines, unsolvability, complexity	1.6—1.8
4	Parsing	5.1—5.3
5	More parsing	5.4—5.5
6	Basic combinatorics on words	2.1—2.4
7	Repetitions in strings and the Thue-Morse word	2.5—2.6
7	Midterm Test	
8	Minimizing finite automata	3.9—3.11
9	Closure properties of CFLs	4.1—4.3
10	More on CFLs	4.4—4.6
11	Kolmogorov complexity	6.1—6.3
12	Busy beaver and the PCP	6.4—6.5
12	Review for Final Exam	