ENGINEERING 5892: Algorithms: Correctness and Complexity

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Communication: Please use the message system in online.mun.ca to email me. My user name is "theo".

CALENDAR ENTRY:

5892 Algorithms: Correctness and Complexity presents fundamental theories and practices for the design of correct and efficient computing systems, including specification of computing systems and their components, correctness with respect to specifications; methods of verification; algorithmic problem solving strategies (such as divide and conquer, dynamic programming); tractability and intractability of computational problems.

CR: the former ENGI 6892
OR: Tutorials 1 hour per week
PR: ENGI 4424, ENGI 4892

CREDIT VALUE: 3 credit hours

COURSE TYPE: Program compulsory

ACCREDITATION UNITS:

Contact hours/week on average over 12 weeks (Lecture/Lab/Tutorial): 3/0/1

CONTENT CATEGORIES: (expressed as %, no category can be 0 < c < 25)

Math	Natural science	Complementary Studies	Engineering Science	Engineering Design
			50	50

SCHEDULE:

LECTURE: M, W, F 2:00-2:50 Room: EN1001
TUTORIAL: Tu 9:00-9:50 Room: EN1051

RESOURCES:

TEXT BOOK

- *Introduction to Algorithms* (3rd ed.), T. H. Cormen, C. E. Leiserson, R. L. Rivest and C. Stein, 2009, MIT Press. ISBN 978-0-262-03384-8 (hardcover), ISBN 978-0-262-53305-8 (pbk.)

MAJOR TOPICS:

- The basics of program specification with preconditions and postconditions.
- Program development using proof outline logic and loop invariants.
- Design of brute-force recursive algorithms.
- Context-free grammars and recursive-descent parsing.
- Big-oh, big-omega, and big-theta notation.
- Design of greedy algorithms.
- Design of dynamic programming algorithms.
- Intractability and the limits of computation.

LEARNING OUTCOMES:

Course Level Graduate Attribute Focus: KP-A, PA-D, Des-D

Upon successful completion of this course, the student will be able to:

	LEARNING OUTCOMES	GRADUATE ATTRIBUTES. LEVEL OF COMPETENCE	Methods of Assessment
1	Design contracts for software modules	KB.8$_\kappa$-A, Des.1-D, PA.1	Assignments, Midterms, Final exam.
2	Design software modules to meet contracts	KB.8$_\kappa$ -A, Des.3-D	Assignments, Midterms, Final exam.
3	Analyze software modules to check whether contracts are met	PA.3-D, KB-1	Assignments, Midterms, Final exam.
4	Use tools (such as Dafny) to verify implementations.	Tools.1-D	Assignments, Midterms, Final exam.
5	Design correct algorithms to solve optimization and other problems	KB.8$_\kappa$ -D, PA.3-D, Des.3-D	Assignments, Midterms, Final exam.
6	Specify formal languages using CFGs and design recursive-descent parsers.	KB.1-A, KB.8$_\kappa$ -A, Des.1-D, Tools.1-D	Assignments, Midterms, Final exam.
7	Use complexity classes to describe the time complexity of algorithms and problems.	KB.1-A, Des.3-A	Assignments, Midterms, Final exam.
8	Design efficient algorithms using greedy algorithms and dynamic programming.	KB.8-A, PA.3-D, Des.3-D	Assignments, Midterms, Final exam.
9	Understand and be able to explain limits of computation.	KB.8-A, KB.1-A	Assignments, Midterms, Final exam.

*Each Graduate Attribute for each learning outcome is rated at a Content Instructional Level of I=Introduced, D=Developed, or A=Applied.

See www.mun.ca/engineering/undergrad/graduateattributes.pdf for definitions on the 12 Graduate Attributes and the Content Instructional Levels.

ASSESSMENT:

- Assignments 25% (Jan. 29, Feb 7, Feb. 28, Mar. 13, Apr. 4)
- Midterms 25% (Feb. 14, Mar. 27)
- Final 45%
- Better of midterms and final: 5%
- Students getting less than 50% on their combined exam mark will receive that mark; i.e., assignments will not be counted in that case.

ACADEMIC INTEGRITY AND PROFESSIONAL CONDUCT:

Students are expected to conduct themselves in all aspects of the course at the highest level of academic integrity. Any student found to commit academic misconduct will be dealt with according to the Faculty and University practices. More information is available at http://www.mun.ca/engineering/undergrad/academicintegrity.php

Students are encouraged to consult the Faculty of Engineering and Applied Science Student Code of Conduct at http://www.mun.ca/engineering/undergrad/academicintegrity.php and Memorial University's Code of Student Conduct at http://www.mun.ca/student/conduct/.

INCLUSION AND EQUITY:

Students who require accommodations are encouraged to contact the Glenn Roy Blundon Centre, http://www.mun.ca/blundon/about/index.php. The mission of the Blundon Centre is to provide and co-ordinate programs and services that enable students with disabilities to maximize their educational potential and to increase awareness of inclusive values among all members of the university community.

The university experience is enriched by the diversity of viewpoints, values, and backgrounds that each class participant possesses. In order for this course to encourage as much insightful and comprehensive discussion among class participants as possible, there is an expectation that dialogue will be collegial and respectful across disciplinary, cultural, and personal boundaries.

STUDENT ASSISTANCE: Student Affairs and Services offers help and support in a variety of areas, both academic and personal. More information can be found at www.mun.ca/student.