Course Outline

Instructor
- Prof. Ian Jeffrey, E.I.T.
  E3–546 EITC
  (204) 474–7476
  Ian.Jeffrey@umanitoba.ca

Office Hours
- Tuesdays and Thursdays
  11:00AM–12:00PM
  or by appointment.
  (Please include ECE 3790 in any correspondence and be sure to email from your University account.)

Teaching Assistant
- Najmeh Saffar
  saffarn@myumanitoba.ca

Contact Hours
- 4 credit hours
- Lectures:
  3 hours x 13 weeks = 39 hours
- Laboratories:
  3 hours x 5 weeks = 15 hours

Prerequisites:
- COMP 2140 Data Structures and Algorithms

Corequisites
- MATH 3132 Engineering Mathematical Analysis 3

Course Website:
http://umanitoba.ca/umlearn

Course Outline

ECE 3790 – Engineering Algorithms

Winter 2020

Course Objectives
The objectives of this course are to introduce students to common engineering algorithms. Students will develop the ability to understand, evaluate, analyze, design, and implement a wide array of generally useful algorithms. These skills will enable students to engineer their own algorithms in the future, or properly use existing engineering algorithms to solve a wide range of problems from sorting and searching, to global optimization.

Course Content
The following topics will be covered:
- Mathematical Foundations
- Asymptotic Complexity Analysis
- General Paradigms (Incremental, Divide-and-Conquer, Greed)
- Divide-and-Conquer
- Greedy Algorithms
- Dynamic Programming
- Numerical methods (Root finding, linear algebra, regression)
- Approximation Algorithms
- Optimization
- Graph Algorithms
- Select Topics

Textbook (optional)

Learning Outcomes
1. The ability to evaluate the computational complexity of algorithms and use complexity analysis to make prudent algorithm choices.
2. The ability to recognize, evaluate, and design recursive algorithms.
3. The ability to recognize general classes of algorithmic problems and apply related algorithm paradigms for solving those problems (divide-and-conquer, greedy algorithms, optimization, etc.)
4. The ability to implement algorithms in software and report the details and performance of these algorithms in an organized and clear fashion.
5. A developed understanding needed to extrapolate and reorganize learned engineering algorithms so that they may be applied to similar, but distinct, engineering problems.

Expected Competency Levels

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<th>KB</th>
<th>PA</th>
<th>IN</th>
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<th>ET</th>
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Important Dates
- Term Quiz
  Friday, February 7th, 2020
  (in-class)
- Term Test
  Thursday, March 5th, 2020
  6:00PM – 8:00PM
- Voluntary Withdrawal Deadline
  March 18th, 2020
- Louis Riel Day
  February 17th, 2020
  No classes or examinations
- Spring Break
  February 18th – 21st, 2020
  No classes or examinations

Updated: January 6, 2020
CEAB Graduate Attributes Assessed

KB.3 – Recalls and defines, and/or comprehends and applies information, first principles, and concept in fundamental engineering science.

ET.2 – Evaluates and selects appropriate tools for a given scenario.

Evaluation

The final course grade is determined by the student’s performance on laboratories, term quiz, midterm test, and final examination. Students must complete all the laboratories in order to be eligible to receive a passing grade.

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<td>Final Examination</td>
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* Method of Feedback: F - Formative (written comments and/or oral discussion), S - summative (numerical grade)

Academic Integrity

Students are expected to conduct themselves in accordance with the highest ethical standards of the Profession of Engineering and evince academic integrity in all their pursuits and activities at the university. As such, in accordance with the General Academic Regulations on Academic Integrity, students are reminded that plagiarism or any other form of cheating in examinations, term tests, assignments, projects, or laboratory reports is subject to serious academic penalty (e.g. suspension or expulsion from the faculty or university). A student found guilty of contributing to cheating by another student is also subject to serious academic penalty.

Requirements/Regulations

- Attendance at lectures and laboratories is essential for successful completion of this course. Students must satisfy each evaluation component in the course to receive a final grade.
- It is the responsibility of each student to contact the instructor in a timely manner if he or she is uncertain about his or her standing in the course and about his or her potential for receiving a failing grade. Students should also familiarize themselves with the University’s General Academic Regulations, as well as Section 3 of the Faculty of Engineering Academic Regulations dealing with incomplete term work, deferred examinations, attendance and withdrawal.
- No programmable devices or systems (such as calculators, PDAs, iPods, iPads, cell phones, smart watches, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.
- Students should be aware that they have access to an extensive range of resources and support organizations. These include Academic Resources, Counselling, Advocacy and Accessibility Offices as well as documentation of key University policies e.g. Academic Integrity, Respectful Behaviour, Examinations and related matters.

Retention of Student Work

Students are advised that copies of their work submitted in completing course requirements (i.e. assignments, laboratory reports, project reports, test papers, examination papers, etc.) may be retained by the instructor and/or the department for the purpose of student assessment and grading, and to support the ongoing accreditation of each Engineering program. This material shall be handled in accordance with the University’s Intellectual Property Policy and the protection of privacy provisions of The Freedom of Information and Protection of Privacy Act (Manitoba). Students who do not wish to have their work retained must inform the Head of Department, in writing, at their earliest opportunity.