University of Manitoba | Price Faculty of Engineering
Department of Electrical and Computer Engineering

Course Outline

Instructors

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Office Hours

- By appointment.
  (Please include ECE 2400 in any correspondence and be sure to email from your University account.)

Teaching Assistant

- Julian Carneiro
  carneirj@myumanitoba.ca
- Shaghayegh Shahiri Tabarestani
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Contact Hours

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

Prerequisite:

- MATH 2132 Engineering Mathematical Analysis 2

Pre- / Co-requisite:

- COMP 2140 Data Structures and Algorithms
- MATH 2136 Mathematics for Computer Engineers

Traditional Territories Acknowledgement

The University of Manitoba campuses are located on the original lands of the Anishinaabeg, Ininiwak, Anisininewuk, Dakota Oyate and Dene, and on the National Homeland of the Red River Métis.

We respect the Treaties that were made on these territories, we acknowledge the harms and mistakes of the past, and we dedicate ourselves to move forward in partnership with Indigenous communities in a spirit of reconciliation and collaboration.

ECE 2400 – Engineering Algorithms 1

Winter 2025

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 while knowing what to expect as problem sizes scale.

Course Content

The following topics will be covered:

- Mathematical Foundations
- Asymptotic Complexity Analysis
- Divide-and-Conquer
- Dynamic Programming
- Greedy Algorithms
- Graph Algorithms
- Select Topics

Textbook (optional)

Introduction to Algorithms, T.H. Cormen, C.E. Leiserson, R. L. Rivest and C. Stein, 3rd Edition, 2009.

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.
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

Outcome	KB	PA	IN	DE	ET	IT	CS	PR	IE	EE	EP	LL
1	D	D	I	D	D							I
2	D	D	I	I	A							I
3	A	D	D	D	A							I
4	D	D	D	A	A	D	D	D				I
5	D	D	D	A	D							D

Copyright Notice

Important Dates

- **Term Test**
  Monday, February 3rd, 2025
  (in class)
  Thursday, March 6th, 2025
  6:00PM–8:00PM
- **Voluntary Withdrawal Deadline**
  March 19th, 2025
- **Louis Riel Day**
  February 17th, 2025
  No classes or examinations
- **Spring Break**
  February 18th – 21st, 2025
  No classes or examinations
- **Good Friday**
  April 18th, 2025
  No classes or examinations

Accreditation Details

Accreditation Units

- Mathematics: 33%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 34%
- Engineering Design: 33%

Graduate Attributes

KB: A knowledge base for engineering
PA: Problem analysis
IN: Investigation
DE: Design
ET: Use of engineering tools
IT: Individual and team work
CS: Communication skills
PR: Professionalism
IE: Impact of engineering on society/ environment
EE: Ethics and equity
EP: Economics and project management
LL: Life-long learning

Competency Levels

I - Introduced (Introductory)
D - Developed (Intermediate)
A - Applied (Advanced)

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 components of the course and receive a minimum grade of 50% in the examination in order to be eligible to receive a passing grade.

Component	Value (%)	Method of Feedback	Learning Outcomes Evaluated
Assignments	5	F, S	1, 2, 3, 5
Laboratories	20	F, S	1, 2, 3, 4, 5
Term Test 1	10	F, S	1, 2, 3, 5
Term Test 2	20	F, S	1, 2, 3, 5
Final Examination	45	S	1, 2, 3, 5

∗ Method of Feedback: **F** - Formative (written comments and/or oral discussion), **S** - summative (numerical grade)

CEAB Graduate Attributes Assessed

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

ET.2 – Adapts or creates tools to meet specific analysis or design needs.

Student Absences

Attendance in lectures, tutorials, and laboratories is mandatory. For short-term absences due to illness or other extenuating circumstances of 120 hours (5 days) or less, students are required to complete a *Self-Declaration Form for Brief or Temporary Absence* available on the University website.🔗 This form must be submitted to the course instructor within 48 hours of the absence. (No additional documentation is required.)
Note that students are responsible to complete any missed work and must consult with the instructor to make appropriate arrangements.
For absences longer than 120 hours, students must contact the instructor and ECE Undergraduate Advisor, Tammy Holowachuk (Tammy.Holowachuk@umanitoba.ca) for further instructions.

Deferred Final Examinations

Students who miss the regular scheduled writing of a final examination, for valid medical or compassionate reasons, may be given the opportunity to write a deferred examination, subject to approval by the Associate Dean (Undergraduate). All requests for a deferred examination must be made within 48 hours of the missed examination, and must follow the procedure described on the Faculty website, without exception. Course instructors do not have the discretion to grant deferred final examinations.
(https://umanitoba.ca/engineering/student-experience#engineering-student-policies)

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.

Grading Scale

Letter	Mark
A+	95–100
A	85–94
B+	80–84
B	70–79
C+	65–69
C	55–64
D	45–54
F	< 45

Note: These boundaries represent a guide for the instructor and class alike. Provided that no individual student is disadvantaged, the instructor may vary any of these boundaries to ensure consistency of grading from year-to-year.

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.

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.

Supplemental Resources