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

Course Outline

Instructor

- Prof. Dustin Isleifson, P.Eng.
  E3–513 EITC
  (204) 474–6553
  Dustin.Isleifson@umanitoba.ca

Office Hours

- Tuesdays & Thursdays
  1:00PM–2:00PM, or by appointment.

Teaching Assistant

- Andrew Baker
  bakera6@myumanitoba.ca
- Dominic Estacio
  estaciod@myumanitoba.ca

Contact Hours

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

Prerequisites:

- ECE 3590 Electromagnetic Theory

Traditional Territories Acknowledgement

The University of Manitoba campuses and research spaces are located on original lands of Anishinaabeg, Ininiwak, Anisininewuk, Dakota Oyate, Dene and Inuit, 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 4290 – Microwave Engineering

Fall 2025

Course Objectives

Microwave Engineering introduces the student to RF/microwave analysis and design techniques. Scattering parameters are defined and used to characterize device and system behaviour. The passive and active devices commonly used as components in a microwave subsystem are studied. Device design procedures and methods to evaluate performance are developed. A computer-aided-design (CAD) platform is used in the laboratory to carry out by simulation the design and performance evaluation of devices. Laboratory assignments, quizzes and project work serve to develop student engineering design and report writing skills.

Course Content

The following topics will be covered:

- An introduction to microwave engineering
- Lines for signal transmission or as circuit elements
- The impedance of line circuits calculated using analytic and Smith chart methods
- Impedance transforming and matching circuits
- Line and waveguide physical structures and associated interconnect components
- Power waves and the network scattering matrix
- Passive device design
- Two-port network transmission properties
- Active device design

Projects

A design project is normally assigned which requires the preparation and submission of a formal report. *Late project submission may be penalized at the rate 10% of project value per day.*

Textbook

Microwave Engineering: Notes for Course ECE 4290, Ernest Bridges. This textbook is available in PDF format from the course webpage.

Other Resources

A list of reference books relevant to the course topics appears in the first chapter of the course notes.

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). This includes the unauthorized use of AI when preparing course deliverables. A student found guilty of contributing to cheating by another student is also subject to serious academic penalty. Integrity also applies to respecting copyrighted course content, which should not be distributed without the creator's permission. Uploading content for the purpose of transcription or other AI-enabled features is commonly a violation of the copyright holder's rights.

Important Dates

- **Term Test**
  October 29th, 2025
  6:00PM – 8:00PM
- **Voluntary Withdrawal Deadline**
  November 18th, 2025
- **National Day for Truth and Reconciliation**
  September 30th, 2025
  No classes or examinations
- **Thanksgiving Day**
  October 13th, 2025
  No classes or examinations
- **Remembrance Day**
  November 11th, 2025
  No classes or examinations
- **Fall Term Break**
  November 10th–14th, 2025
  No classes or examinations

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 60%
- Engineering Design: 40%

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)

Learning Outcomes

1. Demonstrate knowledge and understanding of microwave analysis methods by solving microwave engineering problems in laboratory assignments and in timed examinations.
2. Analyze passive and active microwave devices to determine their circuit properties.
3. Model a microwave circuit or system and obtain its performance characteristics using computer-aided design methods.
4. Identify standard types of transmission line structures, waveguide structures, and associated interconnect components.
5. Design passive and active microwave devices and transmission line structures to meet specified performance requirements.

Expected Competency Levels

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

Evaluation

The final course grade is determined by the student's performance on quizzes, laboratory assignments, a project, term test, and final examination. Students must complete all project and laboratory assignments in order to be eligible to receive a passing grade.

In the event that a student misses the Term Test for medical or compassionate reasons, a deferred test will not be given and the value of the Final Examination will be increased to 75%.

Component	Value (%)	Method of Feedback	Learning Outcomes Evaluated
Project	5	F, S	1, 2, 3, 5
Quizzes	5	F	1, 2, 4, 5
Laboratories	15	F, S	1, 2, 3, 4, 5
Term Test	25	F, S	1, 2, 4, 5
Final Examination	50	S	1, 2, 4, 5

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

CEAB Graduate Attributes Assessed

DE.3 – Develops/implements possible solutions to an open-ended design problem, leading to an appropriate recommendation.

CS.1 – Designs and produces effective written and graphical engineering documents for specific audiences (i.e., research reports, engineering reports, design documents).

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.

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.

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)

Requirements and 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, 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

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.

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