



## Course Outline

### Instructor

- Ekram Hossain, P.Eng.  
E1-552 EITC  
(204) 474-8908  
Ekram.Hossain@umanitoba.ca
- Amine Mezghani,  
E3-511 EITC  
(204) 474-6832  
Amine.Mezghani@umanitoba.ca

### Office Hours

- By appointment

### Teaching Assistant

- Mahsa Shab  
shabm@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 3780 Signal Processing 1
- ECE 4260 Communication Systems

## Traditional Territories Acknowledgement

*The University of Manitoba campuses and the Department of Electrical and Computer Engineering are located on original lands of the Anishinaabeg, Cree, Ojibwe-Cree, Dakota, and Dene peoples, and on the 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 4250 – Digital Communications

Winter 2024

### Course Objectives

To introduce the principles of digital communication, methods and tools for analysis and design of digital communication systems, including simulation in Simulink.

### Course Content

The following topics will be covered:

- A/D conversion and source coding
- Digital modulation and geometric representations
- Digital receiver design
- Inter-symbol interference
- Error control coding
- Synchronization (time-permitting)
- OFDM (time-permitting)

### Textbook

*Fundamentals of Communication Systems*, J.G. Proakis and M. Salehi, 2nd edition, Pearson-Prentice Hall, 2014.

### Other Resources

*Principles of Digital Communication*, R. G. Gallager, vol. 1, Cambridge University Press, 2008.

(<https://www.cambridge.org/core/books/principles-of-digital-communication/8EC09E974B567D5A045A4438759DE077>)

### Learning Outcomes

1. Design and analyze quantizers.
2. Analyze digital modulation techniques using signal processing tools.
3. Design optimum digital receivers.
4. Understand and apply basic error control coding methods.
5. Simulation and implementation of digital communication systems using Simulink and software-defined radio.

### Expected Competency Levels

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

### CEAB Graduate Attributes Assessed

PA.3 – Analyzes and solves complex engineering problems.

IN.3 – Interprets results and reaches appropriate conclusions.

## Important Dates

- **Term Test**  
Monday, March 4<sup>th</sup>, 2024  
6:00PM–8:00PM
- **Voluntary Withdrawal Deadline**  
March 20<sup>th</sup>, 2024
- **Louis Riel Day**  
February 19<sup>th</sup>, 2024  
No classes or examinations
- **Spring Break**  
February 20<sup>th</sup>–23<sup>rd</sup>, 2024  
No classes or examinations
- **Good Friday**  
March 29<sup>th</sup>, 2024  
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)

## Evaluation

The final course grade is determined by the student's performance on assignments, in laboratories, and on examinations. Students must complete all the laboratories in order to be eligible to receive a passing grade.

Component	Value (%)	Method of Feedback	Learning Outcomes Evaluated
Assignments	15	F, S	1, 2, 3, 4, 5
Laboratories	15	F, S	1, 2, 3, 4, 5
Term Test	20	F, S	1, 2, 3
Final Examination	50	S	1, 2, 3, 4, 5

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

## 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.

## Copyright Notice

All materials provided in this course are copyright and are provided under the fair dealing provision of the Canadian Copyright Act. This material may not be redistributed in any manner without the express written permission of the relevant copyright holder.

## 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.

## 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.

## 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 passing 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](#)