

UniversityPrice Faculty of Engineeringof ManitobaDepartment of Electrical and Computer Eng

Department of Electrical and Computer Engineering

Course Outline

Instructor

• Blair Yoshida, P.Eng. E3-411 EITC (204) 480-1402 Blair. Yoshida@umanitoba.ca

Office Hours

· After lectures or by appointment

Teaching Assistant

- · Amir Bani Saeed banisaea@myumanitoba.ca
- · Amirali Kaabinejadian kaabinea@myumanitoba.ca
- Meisam Mohseni mohsenim@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 2160 Electronics 2E
- ECE 3780 Signal Processing 1

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 4150 – Control Systems

Fall 2024

Course Objectives

This course provides an introduction to modelling, analysis, and design of feedback control systems. This course not only focuses on mathematical concepts in continuous-time linear control systems, including Laplace Transform, transfer functions and controller design, but also provides students with hands-on experience in analysis and design of feedback control systems. After this course, students are expected to know how to analyze the performance of feedback control systems and design controllers to meet the required system specifications.

Course Content

The following topics will be covered:

- · Introduction to control systems.
- · Mathematical models of systems.
- · Feedback control systems characteristics and performance.
- Stability of linear feedback systems.
- The root locus method.
- · Frequency response methods, and stability in the frequency domain.
- Introduction to compensator design.

Laboratories

Complete experimental data for all five laboratories must be recorded in a laboratory notebook. At the end of each experiment, the notebook must be signed by the Teaching Assistant.

Textbook

Modern Control Systems, R. C. Dorf and R. H. Bishop, Pearson Prentice Hall, 14th edition, 2022.

Learning Outcomes

- 1. Ability to convert a feedback control system a mathematically description which can be manipulated.
- 2. Ability to analyze a feedback control system to predict its behaviour.
- 3. Ability to predict the stability of a feedback control system.
- 4. Ability to design components of a feedback control system.

Expected Competency Levels

Outcome	КВ	PA	IN	DE	ET	ІТ	CS	PR	IE	EE	EP	LL
1	D	D	D				D					D
2	А	D	D	Ι	D		D					D
3	D	D	D	Ι	D		D					D
4	А	А	А	А	D							D

Copyright Notice

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Important Dates

- Term Test October 23rd, 2024 6:00PM – 8:00PM
- Voluntary Withdrawal Deadline November 19th, 2024
- National Day for Truth and Reconciliation September 30th, 2024 No classes or examinations
- Thanksgiving Day October 14th, 2024 No classes or examinations
- Remembrance Day November 11th, 2024 No classes or examinations
- Fall Term Break November 12th-15th, 2024 No classes or examinations

Accreditation Details

Accreditation Units

- Mathematics: 0%
- Natural Science: 0%
- Complementary Studies: 0%
- Engineering Science: 70%
- Engineering Design: 30%

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 will be determined from a student's performance in laboratories, and on examinations. Programmable calculators are not allowed in the mid-term, and final examination. Students must receive a minimum of 50% on the final examination and must complete all the laboratories in order to be eligible to receive a passing grade.

Component	Value (%)	Method of Feedback	Learning Outcomes Evaluated
Quizzes	10	F, S	1, 2, 3, 4
Assignments	5	F, S	1, 2, 3, 4
Laboratories	10	F, S	1, 2, 3, 4
Term Test	25	F, S	1, 2, 3, 4
Final Examination	50	S	1, 2, 3, 4

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

CEAB Graduate Attributes Assessed

- KB.4 Recalls and defines, and/or comprehends and applies, first principles and concepts in specialized engineering science.
- IN.1 Gathers information (literature review, measurements, experiments, laboratory exercises) and analyzes data.

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)

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. Copyright Notice

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Grading Scale

Letter	Mark
A+	95-100
А	85–94
B^+	80-84
В	70–79
C+	65–69
С	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-toyear.

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