Course Outline

Instructor
- Prof. Gabriel Thomas, P.Eng.
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Office Hours
- By appointment

Teaching Assistant
- Rashmi Boragolla
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- Maryam Karimi
  karimimm@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

Course Website:
http://ece.eng.umanitoba.ca/undergraduate/ECE4830

ECE 4830 – Signal Processing 2

Course Objectives
This course covers the representation of discrete-time signals and systems in the time and complex-frequency domains. The main mathematical tool will be the z-transform and, as such, students will learn its application to the study and design of various discrete-time linear time-invariant (LTI) systems. The laboratory sessions will introduce students to basic real-time digital signal processing technology and will provide students with hands-on experience in the application of many of the theoretical concepts learned in the course.

Course Content
The following topics will be covered:
- Properties of discrete-time signals and systems.
- Modelling discrete-time linear time-invariant (LTI) systems.
- Difference equation methods.
- The z-transform and its application to LTI systems.
- Frequency-domain analysis of discrete-time signals.
- Digital filters.

Textbook (optional)

Learning Outcomes
1. Understand fundamentals of discrete-time signals and systems.
2. Modelling discrete-time linear time-invariant (LTI) systems.
3. Analyze discrete-time systems using the z-transform.
4. Analyze discrete-time systems in the frequency domain.
5. Ability to analyze and design digital filters.

Expected Competency Levels

<table>
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<tr>
<th>Outcome</th>
<th>KB</th>
<th>PA</th>
<th>IN</th>
<th>DE</th>
<th>ET</th>
<th>IT</th>
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CEAB Graduate Attributes Assessed
PA.3 – Analyzes and solves complex engineering problems.
DE.3 – Develops/implements possible solutions to an open-ended design problem, leading to an appropriate recommendation.
Evaluation

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

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<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<tr>
<td>Laboratories</td>
<td>20</td>
<td>F, S</td>
<td>1, 2, 3, 4, 5</td>
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<td>Term Test</td>
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<td>Final Examination</td>
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<td>S</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.