Course Outline

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

Office Hours
• By appointment

Teaching Assistant
• TBD

Contact Hours
• 4 credit hours
• Lectures
  3 hours × 13 weeks = 39 hours
• Laboratories
  3 hours × 5 weeks = 15 hours

Prerequisites:
• ECE 4150 Control Systems
• ECE 4830 Signal Processing 2

Course Website:
http://ece.eng.umanitoba.ca/undergraduate/ECE4420/

ECE 4420 – Digital Control

Course Objectives

This course provides an introduction to analysis and design of computer-controlled systems. This course not only focuses on mathematical concepts in digital control, including Z-transform, transfer functions, state space models and digital controllers design, but also provides students with hands-on experience in analysis and design of digital control systems using simulation software. After this course, students are expected to know how to analyze the performance of digital control systems and design feedback controllers to meet the required performance system specifications.

Course Content

The following topics will be covered:

• Introduction to digital control systems.
• Feedback control systems characteristics and performance.
• Sampled data systems.
• Transfer functions and state-space models
• Discrete system analysis using z-transform and inverse z-transform.
• Discrete equivalents to continuous systems.
• Design using transform techniques.
• Effects of sampling and quantization.

Laboratories

Complete experimental data for all 5 laboratories must be recorded in a lab notebook. At the end of each experiment, the notebook must be signed by the Teaching Assistant.

Textbook


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, wireless communication or data storage devices) are allowed in examinations unless approved by the course instructor.

Important Dates

• Term Test
  March 3rd, 2015
• Voluntary Withdrawal Deadline
  March 19th, 2015
• Mid-term Break
  February 16–20, 2015
  No classes or examinations
• Good Friday
  April 3rd, 2015
  No classes or examinations
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 design components of a feedback control system.

Expected Competency Levels

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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 examinations. 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.

<table>
<thead>
<tr>
<th>Component</th>
<th>Value (%)</th>
<th>Method of Feedback</th>
<th>Learning Outcomes Evaluated</th>
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<tr>
<td>Quizzes / Class participation</td>
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<td>F, S</td>
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<tr>
<td>Laboratories</td>
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<td>F, S</td>
<td>1, 2, 3</td>
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<td>Mid-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.