UNIVERSITY of GUELPH

ENGG*3390 Signal Processing

Fall 2019
Section(s): C01

School of Engineering
Credit Weight: 0.50
Version 1.00 - September 04, 2019

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1 Course Details

1.1 Calendar Description

This course will establish the fundamental analysis and design techniques for signal processing systems. Topics covered include: definition and properties of linear time-invariant systems; impulse response and convolution; continuous-time Laplace transform, Fourier series, Fourier transform; discrete-time Fourier transform, discrete-time Fourier series, fast Fourier transform, Z transform; complex frequency response; filter analysis and design for both continuous and discrete time systems. Students will be able to design continuous-time filters and both design and implement discrete-time digital filters using computer-based tools.

Pre-Requisites: ENGG*2400

1.2 Timetable

Lectures:

Tuesdays & Thursdays 8:30-9:50 ROZH 103

Laboratory:

Tuesday	Sec 01	3:30-5:20 PM	THRN 2307
Friday	Sec 02	3:30-5:20 PM	THRN 2307

| Monday | Sec 03 | 3:30-5:20 PM | THRN 2307 |
| Thursday | Sec 04 | 3:30-5:20 PM | THRN 2307 |

1.3 Final Exam

Time: Dec 11 11:3-13:30. Room: TBA

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2 Instructional Support

2.1 Instructional Support Team

Instructor:	Bob Dony
Email:	rdony@uoguelph.ca
Telephone:	+1-519-824-4120 x53458
Office:	THRN 2341
Office Hours:	TBA on Courselink or by appointment

2.2 Teaching Assistants

Teaching Assistant:	Nicholas Belanger
Email:	belangen@uoguelph.ca
Teaching Assistant:	Rohini Prabhakar Gaikar
Email:	rgaikar@uoguelph.ca
Teaching Assistant:	Mohammad Ali Lordifar
Email:	mlordifa@uoguelph.ca
Teaching Assistant:	Abolfazl Rahimnejad
Email:	arahimne@uoguelph.ca

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3 Learning Resources

3.1 Required Resources

Course Website (Website)
http://courselink.uoguelph.ca
Course material, news, announcements, and grades will be regularly posted to the ENGG*3390 Courselink site. You are responsible for checking the site regularly.

Haykin, S., Van Veen, B., Signals and Systems, 2nd edition, Wiley, 2004. (Textbook)

3.2 Recommended Resources

Monson H. Hayes, Schaum's Outline of Digital Signal Processing, McGraw-Hill, 1999 (Textbook)
   On Reserve

Hwei P. Hsu, Schaum's Outline of Signals and Systems, McGraw-Hill, 1995 (Textbook)
   On Reserve

Bary Van Veen (Website)
   http://AllSignalProcessing.com

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4 Learning Outcomes

4.1 Course Learning Outcomes

By the end of this course, you should be able to:

1. Define the attributes of linear time-invariant systems and use convolution by the impulse response to calculate responses to arbitrary functions.

2. Identify the basic properties of signals and systems and identify what transforms and relationships   apply to the various signals and system properties.

3. Define and apply the various continuous-time signal transforms, including: Laplace transform, Fourier series, Fourier transform.

4. Define and apply the various discrete-time signal transforms, including: discrete-time Fourier trans- form, discrete-time Fourier series, fast Fourier transform, Z transform.

5. Identify the relationships between the transforms, when they are and are not applicable to problems   in signal processing systems design and analysis.

6. Design both electronic and digital filters to enhance signal quality; Enumerate the advantages and disadvantages of filter types; Evaluate their general frequency response, and design specific filters to meet performance requirements.

7. Apply the above transforms and design techniques to real systems and applications such as audio processing, communication systems, biological systems and biomedical systems

4.2 Engineers Canada - Graduate Attributes (2018)

Successfully completing this course will contribute to the following:

#	Outcome	Learning Outcome
1	Knowledge Base	1, 2

#	Outcome	Learning Outcome
1.1	Recall, describe and apply fundamental mathematical principles and concepts	1, 2
1.2	Recall, describe and apply fundamental principles and concepts in natural science	2
2	Problem Analysis	1, 3, 4, 6, 7
2.1	Formulate a problem statement in engineering and non-engineering terminology	3, 4
2.2	Identify, organize and justify appropriate information, including assumptions	3, 7
2.3	Construct a conceptual framework and select an appropriate solution approach	7
2.4	Execute an engineering solution	1, 4, 6
4	Design	6
4.1	Describe design process used to develop design solution	6

5 Teaching and Learning Activities

5.1 Lecture Schedule

Lecture	Lecture Topics	Textbook	Learning Objectives
Thu Sep 5	Introduction, Laplace Review	1.1-1.6, Ch 6	1, 3
Tue Sep 10	Laplace Review, Discrete Time More signals and systems,	Ch 6, 1.3.7, 1.4-1.5	1, 2, 3
Thu Sep 12	Discrete time systems	1.5-1.8, 2.9, 10, 12, 13	1, 2
Tue Sep 17	Z Transform	Ch 7	4
Thu Sep 19	System Transfer Function	Ch 7	1
Tue Sep 24	Convolution	2.1, 2.2, 2.3, 2.4, 2.5	1
Thu Sep 26	Properties of Impulse Response	2.6-2.8	1, 3, 6
Tue Oct 1	Frequency Response	3.2, 7.8, 6.13	1
Thu Oct 3	Filter Design, Standard Filter Types	8.5, extra	6

Tue Oct 8	Passive Filter Synthesis	extra	6
Thu Oct 10	Passive and Active Filters	extra	6
	Fall Break		
Thu Oct 17	Midterm Review	N/A	-
Tue Oct 22	Midterm	N/A	-
Thu Oct 24	Digital Filters: IIR	8.8, 8.10	6
Tue Oct 29	Digital Filters: FIR	8.9	6
Thu Oct 31	Fourier Representation, Discrete-time Fourier Series	3.1-3.3	4
Tue Nov 5	Continuous-time Fourier Series, Discrete-time Fourier Transform	3.4	4
Thu Nov 7	Continuous-time Fourier Transform	3.5,3.6	3, 4
Tue Nov 12	Properties of Fourier Representation	3.7	3
Thu Nov 14	Mixed Signals	4.1-4.3	3, 4, 5
Tue Nov 19	Sampling	4.4, 4.5	3, 4, 5
Thu Nov 21	Reconstruction	4.6	3, 4, 5
Tue Nov 26	Communication Systems	5.1-5.4	7
Thu Nov 28	End of Term Review	N/A	-

5.2 Lab Schedule

Weeks	Topic	Due
Sep 9-13	Introduction to Lab Equipment and Safety Training	-
Sep 16-20 -- Sep 22-Sep 27	DSP and Signals	Sep 30-Oct 4 in lab
Sep 30- Oct 4 -- Oct 7-11	Convolution	Oct 24 in class
Oct 14-18	Midterm Exam Break	-
Oct 28-Nov 1	Filtering and Frequency Response	Nov 4-8 in lab
Nov 4-8 -- Nov 11-15	FIR and IIR Filter Design	Nov 18-22 in lab
Nov 18-22	Frequency Domain Filtering	Nov 28 in class

5.3 Other Important Dates

Monday October 14: Thanksgiving Holiday

Tuesday October 15: Fall Study Break Day

Thursday, November 28, 2019: Make up for Study Day (Tuesday Schedule)

Friday, November 29, 2019: Make up for Thanksgiving Day (Monday Schedule)

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6 Assessments

6.1 Marking Schemes & Distributions

Name	Scheme A (%)
Quizzes & Assignments:	5
Labs	20
Midterm Exam	25
Final Exam	50
Total	100

6.2 Assessment Details

Quizzes & Assignments: (5%)
  Date: , In Class
  Learning Outcome: 1, 2, 5
  (Best 5 of 6)

  Sept 17, in class
  Oct 1, in class
  Oct 17, in class
  Oct 31, in class
  Nov 14, in class
  Nov 26, in class

Labs (20%)
  Learning Outcome: 2, 3, 4, 6
  See Lab Schedule.

Midterm Exam (25%)
  Date: Tue, Oct 22, 8:30 AM - 9:50 AM, In Class
  Learning Outcome: 1, 2, 3

Final Exam (50%)
  Date: Wed, Dec 11, 11:30 AM - 1:30 PM, TBA
  Learning Outcome: 1, 2, 3, 4, 5, 6, 7
  TBA

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7 Course Statements

7.1 Course Grading Policies

Missed Assessments: If you are unable to meet an in-course requirement due to medical, psychological, or compassionate reasons, please email the course instructor. See the undergraduate calendar for information on regulations and procedures for Academic Consideration: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Accommodation of Religious Obligations: If you are unable to meet an in-course requirement due to re- ligious obligations, please email the course instructor within two weeks of the start of the semester to make alternate arrangements. See the undergraduate calendar for information on regulations and procedures for Academic Consideration of Religious Obligations: http://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-accomrelig.shtml

Missed midterm: If you miss the midterm due to grounds for granting academic consideration or religious accommodation, the weight of the missed midterm will be added to the final exam weight. There will be no make-up midterm test.

Lab Work: You must attend and complete all laboratories. If you miss a laboratory due to grounds for granting academic consideration or religious accommodation, arrangements must be made with the teaching assistant to complete a make-up lab.

Late Lab Reports: Late submission of lab reports will not be accepted.

Quizzes: Because the quiz grade is calculated using the best 5 out of 6 quizzes, academic consideration
will only be granted if you have grounds for missing 2 or more quizzes. If academic consideration is

granted, the quiz weighting will be moved to the final exam weight.

Passing Grade: As per University policy, the minimum passing grade is 50%

8 School of Engineering Statements

8.1 Instructor's Role and Responsibility to Students

The instructor's role is to develop and deliver course material in ways that facilitate learning for a variety of students. Selected lecture notes will be made available to students on Courselink but these are not intended to be stand-alone course notes. Some written lecture notes will be presented only in class. During lectures, the instructor will expand and explain the content of notes and provide example problems that supplement posted notes. Scheduled classes will be the principal venue to provide information and feedback for tests and labs.

8.2 Students' Learning Responsibilities

Students are expected to take advantage of the learning opportunities provided during lectures and lab sessions. Students, especially those having difficulty with the course content, should also make use of other resources recommended by the instructor. Students who do (or may) fall behind due to illness, work, or extra-curricular activities are advised to keep the instructor informed. This will allow the instructor to recommend extra resources in a timely manner and/or provide consideration if appropriate.

8.3 Lab Safety

Safety is critically important to the School and is the responsibility of all members of the School: faculty, staff and students. As a student in a lab course you are responsible for taking all reasonable safety precautions and following the lab safety rules specific to the lab you are working in. In addition, you are responsible for reporting all safety issues to the laboratory supervisor, GTA or faculty responsible.

9 University Statements

9.1 Email Communication

As per university regulations, all students are required to check their e-mail account regularly: e-mail is the official route of communication between the University and its students.

9.2 When You Cannot Meet a Course Requirement

When you find yourself unable to meet an in-course requirement because of illness or compassionate reasons please advise the course instructor (or designated person, such as a teaching assistant) in writing, with your name, id#, and e-mail contact. The grounds for Academic Consideration are detailed in the Undergraduate and Graduate Calendars.

Undergraduate Calendar - Academic Consideration and Appeals
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-ac.shtml

Graduate Calendar - Grounds for Academic Consideration
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

Associate Diploma Calendar - Academic Consideration, Appeals and Petitions
https://www.uoguelph.ca/registrar/calendars/diploma/current/index.shtml

9.3 Drop Date

Students will have until the last day of classes to drop courses without academic penalty. The deadline to drop two-semester courses will be the last day of classes in the second semester. This applies to all students (undergraduate, graduate and diploma) except for Doctor of Veterinary Medicine and Associate Diploma in Veterinary Technology (conventional and alternative delivery) students. The regulations and procedures for course registration are available in their respective Academic Calendars.

Undergraduate Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-drop.shtml

Graduate Calendar - Registration Changes
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/genreg-reg-regchg.shtml

Associate Diploma Calendar - Dropping Courses
https://www.uoguelph.ca/registrar/calendars/diploma/current/c08/c08-drop.shtml

9.4 Copies of Out-of-class Assignments

Keep paper and/or other reliable back-up copies of all out-of-class assignments: you may be asked to resubmit work at any time.

9.5 Accessibility

The University promotes the full participation of students who experience disabilities in their academic programs. To that end, the provision of academic accommodation is a shared responsibility between the University and the student.

When accommodations are needed, the student is required to first register with Student Accessibility Services (SAS). Documentation to substantiate the existence of a disability is required; however, interim accommodations may be possible while that process is underway.

Accommodations are available for both permanent and temporary disabilities. It should be noted that common illnesses such as a cold or the flu do not constitute a disability.

Use of the SAS Exam Centre requires students to book their exams at least 7 days in advance and not later than the 40th Class Day.

For Guelph students, information can be found on the SAS website
https://www.uoguelph.ca/sas

For Ridgetown students, information can be found on the Ridgetown SAS website
https://www.ridgetownc.com/services/accessibilityservices.cfm

9.6 Academic Integrity

The University of Guelph is committed to upholding the highest standards of academic integrity, and it is the responsibility of all members of the University community-faculty, staff, and students-to be aware of what constitutes academic misconduct and to do as much as possible to prevent academic offences from occurring. University of Guelph students have the responsibility of abiding by the University's policy on academic misconduct regardless of their location of study; faculty, staff, and students have the responsibility of supporting an environment that encourages academic integrity. Students need to remain aware that instructors have access to and the right to use electronic and other means of detection.

Please note: Whether or not a student intended to commit academic misconduct is not relevant for a finding of guilt. Hurried or careless submission of assignments does not excuse students from responsibility for verifying the academic integrity of their work before submitting it. Students who are in any doubt as to whether an action on their part could be construed as an academic offence should consult with a faculty member or faculty advisor.

Undergraduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/undergraduate/current/c08/c08-amisconduct.shtml

Graduate Calendar - Academic Misconduct
https://www.uoguelph.ca/registrar/calendars/graduate/current/genreg/index.shtml

9.7 Recording of Materials

Presentations that are made in relation to course work - including lectures - cannot be recorded or copied without the permission of the presenter, whether the instructor, a student, or guest lecturer. Material recorded with permission is restricted to use for that course unless further permission is granted.

9.8 Resources

The Academic Calendars are the source of information about the University of Guelph's procedures, policies, and regulations that apply to undergraduate, graduate, and diploma programs.

Academic Calendars
https://www.uoguelph.ca/academics/calendars

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