ENGG*3390 Signal Processing

School of Engineering, University of Guelph
Fall 2008

(September 1, 2008)

Instructor:

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Prerequisites:

Prerequisites: ENGG*2400
NOTE: You will not receive a final grade for this course if you do not have the correct prerequisites.

Schedule:

Class times: MWF 13:30 to 14:20 (MACK 312)

Lab times: M 14:30-16:20 (Thorn 2307)

Course 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 ststems. Students will be able to design continuous-time filters and both design and implement discrete-time digital filters using computer-based tools.

Course Objectives:

Students who complete this course should be able to:

- Define the attributes of linear time-invariant systems and use convolution by the impulse response to calculate responses to arbitrary functions.
- Identify the basic properties of signals and systems and identify what transforms and relationships apply to the various signals and system properties.
- Define and apply the various continuous-time signal transforms, including: Laplace transform, Fourier series, Fourier transform.
- Define and apply the various discrete-time signal transforms, including: discrete-time Fourier transform, discrete-time Fourier series, fast Fourier transform, Z transform.
- Identify the relationships between the transforms, when they are and are not applicable to problems in signal processing systems design and analysis.
- 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.
- Apply the above transforms and design techniques to real systems and applications such as audio processing, communication systems, biological systems and biomedical systems

Course Text:

Haykin, S., Van Veen, B., *Signals and Systems*, 2nd edition, Wiley, 2004.

Major Topics:

Signals, systems, and signal processing. Linear time-invariant systems. Fourier representation for signals. Frequency domain processing. Discrete-time Z transform. Filter analysis and design for both continuous and discrete time systems.

Evaluation:

Labs (4)	30%
Quizzes (5)	10% (best 4 of 5)
Midterm exam	20%
Final exam	40%

Important dates:

Lab 1 due	Sept. 22
Quiz 1	Wed. Sept. 24
Quiz 2	Wed. Oct. 8
Lab 2 due	Oct. 13
Quiz 3	Mon. Oct. 20
Midterm exam	Wed. Oct. 22, In class
Quiz 4	Wed. Nov. 4
Lab 3 due	Nov. 7
Quiz 5	Wed. Nov. 19
Lab 4 due	Nov. 21
Final exam	Tues. Dec. 2, 19:00 - 21:00

Academic Misconduct:

Please familiarize yourself with your Academic Responsibilities, and the Regulations and Procedures as outlined in the Undergraduate Calendar. Please also note the School of Engineering site on Academic Misconduct and the School of Engineering Code of Ethics

The policy for this course is zero tolerancy for any form of academic misconduct. Further, **late labs will not be graded** and **missed quizzes will be assigned a grade of 0** (only 4 of 5 are counted).

Tentative Schedule:

Week	Topics	Text
1	Signals, systems, and signal processing	1.1-1.8, 6
2	Discrete-time systems	2.9-2.12, 7
3	Convolution	2.1-2.8
4	Sinusoidal steady state	3.2, 7.8
5,6	Filter Design	8, extra
7-10	Fourier representation	3, 4
11	Communication systems	5
12	Applications	extra