ESE 305: Deterministic Signals and Systems
Summer 2018

Catalog Description:
Introduction to signals and systems. Manipulation of simple analog and
digital signals. Relationship between frequencies of analog signals and
their sampled sequences. Sampling theorem. Concepts of linearity,
time-invariance, causality in systems. Convolution integral and
summation; FIR and IIR digital filters. Differential and difference
equations. Laplace transform, Z-transform, Fourier series and Fourier
transform. Stability, frequency response and filtering. Provides general
background for subsequent courses in control, communication,
electronics, and digital signal processing.

Course Designation: Required Course

Oxford University Press. ISBN: 978-0-19-515661-4

Prerequisites: Pre- or Corequisite: ESE 271

Coordinator: Sangjin Hong

Goals: Introduce basic concepts in signals and systems and associated
mathematical and computational tools

Course Learning Outcomes:
• ability to apply knowledge of mathematics, science and
  engineering
• an ability to identify, formulate, and solve engineering problems
• an ability to use techniques, skills, and modern engineering tools
  necessary for engineering practice

Topics Covered:

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<tr>
<th>Week 1.</th>
<th>Overview; signals and properties; signal transformations; Periodic signals; Impulses; Systems; System properties</th>
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<tr>
<td>Week 2.</td>
<td>DT and CT LTI Systems and Convolution; Intro to Frequency Domain and Fourier Series</td>
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<td>Week 3.</td>
<td>Fourier Series in CT and DT; Fourier Series properties; Frequency representation of systems</td>
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Week 4.  | Filtering; Introduction to Fourier Transform; Fourier Transform and LTI Systems
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Week 5.  | Discrete-Time Fourier Transform; Sampling; Intro to communications systems
Week 6.  | Laplace Transform; Laplace Transform; Final review

**Class/laboratory Schedule:** 6 lecture hours per week

**Student Outcomes**

- (a) an ability to apply knowledge of mathematics, science and engineering 40% contribution*
- (b1) an ability to design and conduct experiments
- (b2) an ability to analyze and interpret data
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
- (d) an ability to function on multi-disciplinary teams
- (e) an ability to identify, formulate, and solve engineering problems 30%
- (f) an understanding of professional and ethical responsibility
- (g) an ability to communicate effectively
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
- (i) a recognition of the need for, and an ability to engage in life-long learning
- (j) a knowledge of contemporary issues
- (k) an ability to use the techniques, skills, and modern engineering tools necessary 30% for engineering practice
- Any other outcomes and assessments?

* Assume that the total contribution of any course will be 100%. Use the right hand column to indicate the approximate percent that the left hand columns contribute to the overall course.

**Document Prepared by:** Sangjin Hong
**Date:** April 4, 2018