

EEE 180 SIGNALS AND SYSTEMS

Required Course

2006 – 2008 Catalog Data: EEE 180. Signals and Systems. Rigorous development of the fundamental relationships governing time-domain and frequency-domain analysis of linear continuous-time and discrete-time systems. Topics include Fourier, Laplace, and z-transforms, sampling theorem, modulation, system stability, and digital filters. Prerequisite: EEE 117. 3 units.

Text: Lathi, B. P., Signal Processing and Linear Systems, Carmichael, CA: Berkeley-Cambridge Press, 1998 (ISBN 0-941413-35-7)

Course Objectives:

1. Integrate basic concepts of signal analysis and linear system theory.
2. Introduce time-domain and transform-domain techniques for describing signals and linear systems and for determining the effects of such systems on signals.
3. Introduce the theory and analysis of both continuous-time and discrete-time signals and systems and to show their relationship.
4. Introduce the student to computer tools (MATLAB) to plot signals and system characteristics and to analyze the effects of systems on signals.

Prerequisites by Topic:

1. Complex number and elementary matrix algebra.
2. Calculus through differential equations.
3. Simple electric circuit analysis.
4. Introduction to transform techniques.

Topics Covered/Class Schedule/Evaluation:

1. Introduction to signals and systems.
2. Continuous-time systems: time-domain analysis.
3. Discrete-time systems: time-domain analysis.
4. Continuous-time systems: Laplace transform analysis.
5. Discrete-time systems: z-transform analysis.
6. Continuous-time signal analysis: Fourier series and Fourier transform.
7. Frequency response of linear, time-invariant, continuous-time systems.
8. Sampling.

Course Outline:

<u>Week</u>	<u>Topic</u>	<u>Text Pages</u>	<u>Homework (H), Quiz (Q)</u>
1	Introduction. Background.	1 – 50	H
2	Introduction to continuous-time signals and systems.	51 – 96	H, Q
3	Introduction to discrete-time signals and systems.	540 – 569	H, Q
4	Continuous-time systems: time-domain analysis.	104 – 165	H, Q
5	Continuous-time time-domain analysis (cont.).		H, Q

6	Discrete-time systems: time-domain analysis.	573 – 611	H, Q

7	Discrete-time time-domain analysis (cont.).		H, Q
8	Continuous-time systems: Laplace transform analysis.	361 – 426	H, Q
9	Laplace transform analysis (cont.).		H, Q
10	Discrete-time systems: z-transform analysis.	668 – 697	H, Q

11	Z-transform analysis (cont.).		H, Q
12	Continuous-time signal analysis. Fourier series.	171 – 226	H, Q
13	Continuous-time signal analysis. Fourier transform.	235 – 309	H, Q
14	Frequency response.	471 – 476	H, Q
15	Sampling.	319 – 330	H,
16	Comprehensive Final Exam		

Evaluation

Weekly quizzes -- Total weight: 50% or 75% of grade (whichever gives the student the highest grade).

(Note: Weekly quizzes are "open book" problems similar to those assigned as homework. Each class period, one or two students are asked to do and explain a homework problem at the board. The grade for this oral presentation is weighted the same as that for a weekly quiz.

Comprehensive final exam -- Weight: 50% or 25% of grade (whichever gives the student the highest grade).

Contribution of Course to Meeting the Professional Component:

- Solution of differential and difference equations.
- Characterization of signals and linear systems; effects of systems on signals.
- Science and Design Content Distribution: Basic Science – 1 units or 33%; Engineering Science – 2 unit or 67%.

Relationship of Course to Program Outcomes:

- #1. Knowledge of mathematics: This course strengthens and extends the techniques for solving differential equations learned in mathematics.
- #3. Problem solving: In this course, students learn to use trigonometry, calculus, and time-domain/frequency-domain transform techniques to characterize signals and linear, time-invariant systems and to analyze the effects of systems on signals.
- #4. Knowledge of core EEE topics: This course provides students with a comprehensive overview of signal and system tools that are necessary for analysis and design throughout the EEE core areas.
- #12. Oral communication: This course provides students with opportunities to make oral presentations of solutions to homework problems.

Course Coordinator: Warren D. Smith, EEE

Date: May 15, 2003