# EE 350 – Continuous-Time Linear Systems

**Designation:** Required core course for electrical engineering majors.

**University Bulletin Description:** EE 350: (4) Introduction to continuous-time linear system theory; differential equation models, sinusoidal steady-state analysis, convolution, Laplace transform and Fourier analysis.
Prerequisites: EE 210, MATH 220, MATH 250.

**Prerequisites by Topics:**
1. A working knowledge of integral and differential calculus.
2. The ability to work with complex numbers.
3. The ability to obtain differential equation models of active and passive circuits.
4. The ability to determine the sinusoidal-steady-state response of a circuit using phasor analysis.

**Textbook/Required Materials:**
*Signal Processing and Linear Systems*, B. P. Lathi, Berkeley-Cambridge, 1998

**Learning Outcomes:**
This course provides a foundation in linear system theory for all electrical engineering majors. After successfully completing the course, students are able to:
1. Understand basic concepts of linear systems and how they interact with continuous-time signals.
2. Use MATLAB to analyze continuous-time signals and systems.

**Topics:**
1. Classification of signals and systems (4 lectures)
2. Classical solutions of ODEs (4 lectures)
3. Stability (1 lecture)
4. Convolution (5 lectures)
5. Sinusoidal steady-state response (1 lecture)
6. Orthogonal signals and generalized Fourier Series (2 lectures)
7. Fourier series (4 lectures)
8. Fourier transform (7 lectures)
9. Laplace transform (8 lectures)
10. Frequency response (4 lectures)

**Class/laboratory schedule:** Three 50-minute lectures and one 2-hour recitation per week and four 2-hour laboratory exercises.

**Computer Usage:** MATLAB is used to facilitate the analysis of signals and systems.

**Laboratory Projects/Assignments:** Four two-hour laboratory sessions demonstrate the applicability of linear system concepts to engineering systems. Students do not submit a formal laboratory report; however, material from the laboratory activities is included in both the problem sets and exams.

**Contribution to Meeting the Requirements of Criterion 5. Curriculum:**
This course contributes to the engineering topics component.
This course enables students to analyze and model dynamic systems using ODEs, impulse response functions, Fourier transform techniques, and Laplace transform methods. It is a prerequisite to many technical electives including electronic circuit design (EE 311), discrete-time linear systems (EE 351), communication systems (EE 360), linear control systems (EE 380), energy conversion (EE 387), power electronics (EE 413), and optical fiber communications (EE 421).

**Relationship to Program Outcomes:**

O.1.1. Graduates will possess mathematics skills necessary for electrical engineering.
O.1.3. Graduates will have attained computer proficiency.
O.2.1. Graduates will understand how to analyze and design simple electrical/electronic circuits.
O.2.3. Graduates will understand the basic concepts of linear systems and how they interact with continuous-time signals.
O.4.2. Graduates will develop an appreciation of continuing educational and professional development.
O.5.1. Graduates will have good teamwork skills.

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