EE - 3160
Signals and Systems

Curricular Designation: EE: required  CpE: required

Catalog Description:
EE 3160 – Signals and Systems Introduces the mathematical analysis of analog signals and systems. Topics include differential equations, convolution, Fourier series, Fourier transforms, Laplace transforms, frequency response, Bode plots, filter design and an introduction to control systems. Credits: 3.0 Lec-Rec-Lab: (3-0-0) Semesters Offered: Fall Spring Summer Restrictions: Must be enrolled in one of the following Major(s): Computer Engineering, Electrical Engineering Pre-requisites: EE 2112 and (MA 2320 or MA 2321) and (MA 3520 or MA 3521 or MA 3530 or MA 3560)

Textbooks(s) and/or Other Required Materials:

Prerequisites by Topic:
3. Familiarity with sinusoids: amplitude, phase, frequency, and representation using complex exponentials.
4. Familiarity with complex arithmetic: magnitude, argument, real, and imaginary components.
5. Familiarity with the mathematical modeling of circuits.
6. Familiarity with the solutions to 1st and 2nd order ordinary linear differential equations.
7. Familiarity with the elementary operations of linear algebra.

Course Objectives:
1. Introduction to the concepts of linearity and time-invariance.
2. Introduction to the representation of common engineering signals.
3. Introduction to continuous-time convolution.
4. Introduction to the Laplace transform and Bode plots.
5. Introduction to the Fourier transform, its properties and applications.
6. Introduction to Fourier series.
7. Introduction to the design of analog filters.

Topics Covered:
1. Signal, periodicity, symmetry, power, energy, the impulse function.
2. System properties: Linearity, time-invariance, causality, stability.
4. Continuous-time convolution by analytical and graphical methods.
5. Transformed domain analysis by Laplace and Fourier transforms.
6. Fourier series of periodic signals and applications.
### Relationship of the Course Content to Program Outcomes:

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<tr>
<th>Outcome</th>
<th>Important</th>
<th>Moderately</th>
<th>Minimally</th>
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<tr>
<td>a an ability to apply knowledge of mathematics, science and engineering</td>
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<td>b an ability to design and conduct experiments, as well as to analyze and interpret data</td>
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<td>c an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, health and safety, manufacturability and sustainability</td>
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<td>d an ability to function on multi-disciplinary teams</td>
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<td>e an ability to identify, formulate and solve engineering problems</td>
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<td>f an understanding of professional and ethical responsibility</td>
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<td>g an ability to communicate effectively</td>
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<td>h the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental and societal context</td>
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<td>i a recognition of the need for, and an ability to engage in life-long learning</td>
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<td>j a knowledge of contemporary issues</td>
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<td>k the ability to use the techniques, skills, and modern engineering tools necessary for the practice of electrical engineering</td>
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### Contribution of Course to Meeting Degree Requirements:

- 2 Credit Hours – Math/Basic Science
- 1 Credit Hour - Engineering Topics

### Class/Laboratory Schedule (note: 1 hour = 50 minutes):
- Lecture: 42 hours = 3 hours/week for 14 weeks

### Prepared by:
- Ashok Ambardar, Associate Professor, November 29, 2016