EE - 3250
Introduction to Communication Theory

Curricular Designation: EE: required  CpE: elective

EE 3250 – Introduction to Communications Theory: Introduction to communications systems and theory; fundamentals of point-to-point communication link design and analysis; analog modulation and demodulation techniques; digital signal representation and filtering; binary data transmission. Credits: 3.0 Lec-Rec-Lab: (3-0-0) Semesters Offered: Fall, Spring

Pre-Requisite(s): EE 3160 and (MA 3720 or EE 3180)

Textbooks(s) and/or Other Required Materials:

Prerequisites by Topic:
1. EE 3180: Familiarity with basic probability theorems, and Random Variables such as Gaussian distributions.
2. EE 3160: Familiarity with Fourier series and Fourier transforms, signals in time and frequency domain, Linear System Theory such as frequency response and impulse response.

Course Objectives:
Upon successful completion of this course, students should be able to:
1. Explain the main characteristics of communication channels;
2. Explain how noise and bandwidth affect the operation of communication systems, and calculate noise metrics (SNR, BER, noise figure);
3. Explain and use Fourier Analysis for communication systems;
4. Understand digital and bandpass signaling and circuits;
5. Explain the fundamentals of AM and FM analog modulations;
6. Explain and use the superheterodyne principle in AM and FM receivers;
7. Explain digital modulated systems.

Topics Covered:
1. Analysis of signal in Time and Frequency Domain
2. Calculation of noise metrics (SNR, BER, noise figure)
3. Fourier Transforms and Fourier Series
4. Amplitude Modulation (Commercial AM, DSB-AM, SSB-AM)
5. Angle Modulation (Commercial FM)
6. Transmitters (AM, FM)
7. Receivers (RF, Superheterodyne)
8. Software Defined Radio (SDR)
9. Introduction to Sampling Theory (Aliasing, Quantization noise)
10. Signal Space Representation Techniques
11. Phase Modulation (BPSK, QPSK, MPSK and QAM)
12. Amplitude Frequency Keying (ASK)
13. Frequency Shift Keying (FSK)

**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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<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:**

3 Credit Hours – Engineering Topics

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

**Prepared by:**
Aurenice Oliveira, Associate Professor, Fall 2016