COURSE: EECS 216. **TITLE:** Introduction to Signals and Systems. **PREREQUISITES:** EECS 215; co-requisite Math 216 | **REQUIRED**

TEXTBOOK: C. Phillips and J. Parr, Signals, Systems and Transforms, 3rd ed., Prentice-Hall

CATALOG DESCRIPTION: Theory and practice of signals and systems engineering in continuous and discrete time. Continuous-time linear time-invariant systems, impulse response, convolution. Fourier series, Fourier transforms, spectrum, frequency response and filtering. Sampling leading to basic digital signal processing using the discrete-time Fourier and the discrete Fourier transform. Laplace transforms, transfer functions, poles and zeros, stability. Applications of Laplace transform theory to RLC circuit analysis. Introduction to communications, control and signal processing. Weekly recitations and hardware/Matlab software laboratories.

COURSE OBJECTIVES:

1. To acquaint students with the basic concepts and properties of continuous-time signals and systems;
2. To teach students how to use Fourier series, and Fourier and Laplace transforms for spectral analysis;
3. To teach students how to use transfer functions and frequency response to analyze and design filters;
4. To introduce students to, and stimulate interest in, communications, control and signal processing;
5. To prepare students for follow-up courses in the Systems area of the Electrical Engineering program.

COURSE OUTCOMES [Program Outcomes Addressed]

1. Ability to compute Fourier series, Fourier transforms, and Laplace transforms using integrals; [1,13]
2. Ability to compute transfer functions, poles & zeros, & frequency response for simple systems; [1,14]
3. Ability to compute zero-state & zero-input responses of a simple system & determine stability; [1,14]
4. Ability to analyze and design simple signal processing filters (lowpass, highpass, bandpass); [1,11,13]
5. Ability to analyze simple analog communications systems using DSB and SSB modulation; [1,11,13]
6. Ability to analyze simple feedback control systems, and to use feedback to alter its stability. [1,11,14]

PROGRAM OUTCOMES ADDRESSED: 1,11
PROFESSIONAL COMPONENT ADDRESSED: 13,14
PREPARED BY: Andrew E. Yagle on March 15, 2006

CLASS/LABORATORY SCHEDULE:
LECTURES: 2 per week @ 90 minutes
RECITATION: 1 per week @ 50 minutes
LABORATORY: 5 hardware & Matlab

TOPICS COVERED:

1. System classification (LTI, etc.)
2. Impulse response & convolution
3. Fourier series and spectrum
4. Fourier transform and properties
5. Laplace transform and properties
6. Transfer functions, poles & zeros
7. Frequency response and filtering
8. s-plane RLC circuit analysis
9. Sampling theorem and the DFT
10. Applications in communication, signal processing, and control

ASSESSMENT (Course outcomes)

1. 10 problem sets [1,2,3,4,5,6]
2. Hardware & software labs [2,4,6]
3. 3 closed-book exams [1,2,3,4,5,6]

COURSE DESCRIPTION: University of Michigan, College of Engineering, ELECTRICAL ENGINEERING PROGRAM