## ECE 303 Signals and Systems

**Required Course** (previously ECE 202)

**Course Description (2009 Bulletin)**
Mathematical framework associated with the analysis of linear systems including signal representation by orthogonal functions, convolution, Fourier and Laplace analysis, and frequency response of circuits and systems. (*3 semester hours*)

**Prerequisites:** ECE 204; MTH 218
**Corequisite:** ECE 303L

**Class Schedule**: 75-minute classes, twice weekly (Spring 2009)

**Class Web Site:** http://www.johnloomis.org/ece202 (Spring 2009)

**Textbook**
Michael J. Roberts, *Signals and Systems: Analysis of Signals Through Linear Systems*, McGraw-Hill, 2004. ISBN-13 9780072930443

**Engineering Tools**
MATLAB , National Instruments Multisim

**Topics**

- Overview of Signals and Systems (Ch. 1)
- Mathematical Description of Signals (Ch. 2)
- Review of complex numbers (Appendix H)
- Convolution (Section 3.6)
- Singularity Functions (Sections 2.3 and 2.9)
- Description and Analysis of Systems (Ch. 3)
- Review of RC and LR circuits (EGR 203 and Section 6.4)
- Fourier Series (Ch. 4)
- Fourier Transform (Ch. 5)
- Review of RLC circuits (EGR 203 and Ch. 6)
- Sampling and the Discrete Fourier Transform (Ch. 7)
- System representation: differential equations and state-space analysis (Ch 12.13)
- Laplace Transform (Ch. 9)
- Laplace Transform Analysis of Signals and Systems (Ch. 10)
- Resonance phenomena, Filter Design (Ch. 10)
- Correlation, Spectral Energy/Power Density (Ch. 8)

**Assessment**
Three exams (60%), assignments and projects (40%)

**Relevant ABET Program Outcomes**

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|---|---|
| **a** | ability to apply knowledge of mathematics, science and engineering. |
| **e** | ability to identify, formulate, and solve engineering problems. |
| **k** | able to use the techniques, skills, and modern engineering tools |

**Course Learning Outcomes**

1. Students will be able to perform system analysis in the frequency and complex frequency domain, using both the Laplace and the Fourier transforms. (a)
2. Students will be able to design and analyze frequency selective filters. (e)
3. Students will be able to use Multisim and MATLAB to solve circuit problems and verify hand calculations. (k)

**Prepared by:** John S. Loomis **Date:** 2 December 2009