

EE 301 - Signals and Systems I - 3 hours
Required Course

1. *2007-2008 Catalog description*
Time and frequency domain analysis of linear systems. Lumped, distributed, time-varying, and discrete-time systems; network topology, state variable techniques; stability.
Prerequisite: EE 206. EE or EEC major.
2. *Prerequisites by topic*
 - a Basic circuit theory.
 - b Time-domain network analysis for DC circuits.
 - c Time-domain & frequency-domain network analysis for AC circuits.
 - d Introductory ordinary differential and difference equations.
3. *Textbook(s) and/or other required material*
Required: "Signals and Systems: Continuous and Discrete," Fourth Edition, by Rodger E. Ziemer, William H. Tranter, and D. Ronald Fanin, Prentice-Hall, 1998.
4. *Class/Laboratory Schedule*
Three class sessions per week, each 50 minutes, for 14 weeks
5. *Topics Covered (Outcomes influenced)*
 - Signals
 - a Description of signals using pulse, step, ramp, impulse, complex exponential functions (7a)
 - b Analysis of waveshapes using basic signals, energy and power signals (7a)
 - c Analysis and synthesis of periodic signals using trigonometric and exponential Fourier series (7b)
 - d Analyses of aperiodic signals using Fourier transform (7c, 7d)
 - Continuous Time Systems
 - a Time domain descriptions of systems with differential equations, linearity and time invariance (7e)
 - b Time domain description using impulse response and convolution (7e)
 - c Calculation of impulse response from differential equation or circuit description using step response (7e)
 - d Transfer function and frequency response, basic filter structures (7f)
 - e Analyses of linear, time-invariant systems using the Laplace transform (7g)
 - f Circuit analyses using Laplace transforms and transfer function in S-domain (7g)
 - g Block diagram representations of linear, time-invariant systems (7g)
 - h Stability of continuous-time, linear dynamic systems (7g)
 - Discrete Time Signals and Systems
 - a Sampling and discrete time signals, Nyquist sampling theorem (7h)
 - b Impulse response of discrete-time system and convolution (7i)
 - c Frequency domain description using z-transform (7j)
 - d Analysis of linear, time-invariant, discrete-time systems using Z transform (7j)
 - e Stability of discrete-time, linear dynamic systems (7j)
 - f Matlab software commands for continuous and discrete-time simulation (7k)
 - g Matlab commands for analysis of continuous and discrete time systems (7k)
 - Grading Policy and ECE Code of Conduct (7l)
6. *Contribution of course to meeting the curriculum components*
Engineering Science - 50%, Engineering Design - 50%
7. *Course Outcomes (Program Outcome contributions): In learning the course topics, the student will attain the following outcomes*
 - a The student will synthesize waveshapes using pulse, step and ramp functions (9A, 9B)
 - b The student will analyze and synthesize periodic signals using trigonometric and Fourier series (9A, 9B)
 - c The student will analyze and synthesize aperiodic signals using the Fourier transform (9A, 9B)

- d The student will apply Fourier transform theorems for modulation, differentiation, delay, including Parseval's theorem and power and energy density spectrums (9B)
- e The student will describe circuits and systems by differential equations and the impulse response (9B, 9C)
- f The student will describe a system by the frequency response function and determine the steady-state response to a sine wave (9B, 9C)
- g The student will solve a differential equation, electrical network, convolution integral, or block diagram for the complete response using Laplace transform techniques and check results using the initial and final value theorems (9B, 9C)
- h The student will determine the sampling rate for discrete time signals (9A, 9B)
- i The student will describe discrete time systems by difference equations and convolution (9A, 9B)
- j The student will describe discrete time signals and systems using Z transforms (9B)
- k The student will use basic Matlab tools for continuous and discrete time analysis and simulation (9B, 9C, 9F)
- l The student will understand the ECE Code of Conduct (9G)

8. *Grading policy and criteria*

There will be four exams worth seventy-five points each and a final worth one hundred and fifty points. Special homework assignments involving simulation will be collected and will count up to fifty points in determining the final grade. An estimate of the letter grade for every two exams will be given when the exam is returned; however, the final grade will be determined by the combined numerical results of all tests. All exams will be closed book. No notes, calculators, or cell phones will be permitted. Exams may include Matlab examples for interpretation. A grade of C corresponds to meeting the minimum competency required to understand course topics and meet course objectives.

Warning: An unexcused absence from a scheduled exam will earn you a zero for that exam. In addition, cheating will be dealt with as described in the *Academic Handbook*. The ECE Faculty has established the ECE Student Code of Conduct based on well known requirements of academic integrity as well as the ethical and professional conduct expected of an engineer. The ECE student code is attached to this document and also appears on Blackboard.

9. *Relationship of course to program outcomes*

label	Program Outcomes (A Graduate from the program will:)	Contribution
A	have knowledge of the mathematical and scientific foundation of electrical engineering	Strong
B	have knowledge of and the ability to apply techniques and technology of electrical engineering	Strong
C	complete a design project sequence, culminating in a capstone project at or near the professional level	Foundational
D	understand that acquisition of new knowledge is needed for success in the electrical engineering profession	Strong
E	meet Bradley's general education requirements which are based on the principles of liberal education	NA
F	have experience in communicating technical information and working on teams	Foundational
G	understand the importance of professional and ethical behavior	Moderate

10. *Prepared by:* Thomas L. Stewart, July 25, 2008.