ECE 308 – Signals and Systems

Credits: 3, **Contact Hours:** Two 75 minute lecture sessions per week.

Coordinator: G. Williamson, Professor of ECE

Textbook: E.W. Kamen and B.S. Heck, *Fundamentals of Signals and Systems*, 3rd edition, 2007.

2019 Catalog Data: **ECE 308**
Signals and Systems
Time and frequency domain representation of continuous and discrete time signals. Introduction to sampling and sampling theorem. Time and frequency domain analysis of continuous and discrete linear systems. Fourier series, convolution, transfer functions. Fourier transforms, Laplace transforms, and Z-transforms.
Prerequisite(s): MATH 252 and MATH 251
Lecture: 3 **Lab:** 0 **Credits:** 3

Prerequisites or co-requisites by topic:

1. Fundamentals of calculus, including multivariate calculus.
2. Linear ordinary differential equations.

Enrollment: Required course for EE majors and elective course for CPE majors

Specific outcomes of instruction:

After completing this course, the student should be able to do the following:

1. Represent a continuous or discrete time signal as a linear combination of basis signals, including step functions, ramp functions, and sinusoidal signals.
2. Determine the response of a linear system to a given signal using time domain analysis techniques.
3. Determine the response of a linear system to a given signal using frequency domain analysis techniques.
4. Determine the response of a linear system to a given signal using transform domain analysis techniques.
5. Choose representations for signals and systems appropriate for addressing given questions about system behavior, and apply these in signal and system analysis.
6. Use computer-based analysis and design tools (such as Matlab software) in the analysis of signals and systems.

Relationship of ECE 308 specific outcomes of instruction to student outcomes:

	Student Outcomes	**Course Goals**
1	An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	1,2,3,4,5,6
2	An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors	
3	An ability to communicate effectively with a range of audiences	
4	An ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts	
5	An ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives	
6	An ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	
7	An ability to acquire and apply new knowledge as needed, using appropriate learning strategies	

Topics:

- Signal fundamentals (0.5 weeks)
- System fundamentals (1 week)
- Time domain discrete-time and continuous-time system responses using convolution (2.5 weeks)
- Fourier series analysis (1 week)
- Fourier transform analysis (1.5 weeks)
- Discrete-time Fourier transform analysis (1 week)
- Discrete Fourier Transform (1 week)
- Frequency response in continuous and discrete time, and ideal filters (1.5 weeks)
- Laplace transforms, continuous time system response, and solution of differential equations (2 weeks)
- Z-transforms, discrete time system response, and solution of difference equations (1.5 weeks)
- Exams (1.5 weeks)

Prepared by: G. Williamson **Date:** 30 March 2020