Department of Electrical and Computer Engineering
The University of Alabama in Huntsville

Spring 2015

# CPE 381: Fundamentals of Signals and Systems for Computer Engineers

**Lectures** Monday/Wednesday 2:20 - 3:40 PM, EB 239.

**Instructor**
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**Office hours** Tuesday 9 - 11 AM, Thursday 4-5 PM, in THN 355 and by appointment.

**Credit** 3 credit hours

**Description** Introduction to the fundamental concepts in continuous and discrete signals and systems, and methods of signal and system analysis. Topics covered: Fourier series, Fourier and Laplace transforms, system representation by transfer functions and impulse response functions, convolution integrals, discrete time signals and system, sampling techniques, Z and discrete Fourier transforms. No credit for EE or OPE students.

**Prerequisites** EE 213 - Electrical Circuit Analysis I, and
MA 238 – Applied Differential Equations.

**Textbook** Luis Chaparro, *Signals and Systems using MATLAB*, 2nd Edition, Elsevier, 2014, ISBN: 978-0-12-394812-0.

## Grading

Academic misconduct of any type will not be tolerated. Students are expected to conform to the UAH policies concerning academic misconduct as outlined in Section 8.32 of the current UAH Student Handbook.

Grades: A (91-100), B (81-90), C (71-80), D (61-70), F (<60).

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| Homework | 20% |
| Programming Project | 20% |
| Midterm Exam | 25% |
| Final Exam | 35% |

Softcopies of all assignments must be submitted electronically through Canvas with hard copy due at the beginning of classes. No late homework is accepted.

## Attendance Policy

Class attendance is mandatory. Up to three unexcused absences are allowed. If your absence is excused, please bring your documentation within one week after the absence.

The University of Alabama in Huntsville will make reasonable accommodations for students with documented disabilities. If you need support or assistance because of a disability, you may be eligible for academic accommodations. Students should identify themselves to the Disability Support Services Office (256.824.6203 or Madison Hall, room 131) and their instructor as soon as possible to coordinate accommodations.

## Important Dates

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|---|---|
| Midterm Exam: | Monday, March 2, 2015, 2:20 - 3:40 PM |
| Programming Project | |
| Phase I | Monday, March 9, 2015 |
| Final project | Wednesday, April 15, 2015 |
| Last day of Class: | Wednesday, April 22, 2015 |
| Final Exam: | Monday, April 27, 2015, 3 - 5:30 PM |

## Topics Covered

- Introduction (2 lectures). Continuous-time and discrete-time signals. Examples of signal processing applications.
- Continuous time Signals (1 lecture). Classification of time-dependent signals. Representation using basic signals.
- Continuous time Systems (3 lectures). System concept. LTI continuous-time systems. Linearity. Time invariance. Convolution integral. Causality. BIBO stability
- The Laplace Transform (3 lectures). Two-sided Laplace. One-sided Laplace. Analysis of LTI systems.
- Frequency Analysis: The Fourier Series (2 lectures). Eigenfunctions. Complex exponential Fourier series. Fourier series from Laplace. Time and frequency shifting. Response of LTI Systems to periodic signals.
- The Fourier Transform (3 lectures). Fourier Transform from Laplace Transform. Inverse proportionality of time and frequency. Spectral representation. Convolution and Filtering. Examples.
- Sampling Theory (2 lectures). Uniform sampling. Nyquist-Shannon sampling theorem.
- Discrete-time signals and systems (2 lectures). Basic discrete-time signals. Recursive and non-recursive discrete-time systems. Convolution sum.
- Real-time System Implementation (2 lectures). Programming and implementation of signal processing algorithms. Real-time performance analysis and optimization.
- The Z-transform (3 lectures). Two-sided Z-transform. One-side Z-transform. Inverse Z-transform with MATLAB.
- Fourier analysis of discrete-time signals and systems (3 lectures). Discrete-time Fourier transform. Discrete Fourier transform.
- Applications (1 lecture).