

Digital Signal Processing

Geological Sciences
Univ. of Texas at El Paso
Instructor: Aaron A. Velasco
Office: 227B Geological Sciences

Spring 2020 • GEOP 5460

CRN: 28155

Lecture: Tu.- Th., 9:00 - 10:20 pm, rm. 302
Office Hrs.: Tu/Th 10:30-11 AM; 3-3:30 PM
E-mail: aavelasco@utep.edu; Ph: x5101

Course Goals and Objectives:

The main goal of this course is for students to understand and be able to apply key concepts of digital signal processing. These fundamental concepts will help students with manipulating and processing time-series data, and includes discrete time series, deconvolution, filtering, Fourier Analysis, and wavelets. The labs will give you an understanding how the theory is applied to real data. This will be accomplished by obtaining a solid background with theory in lecture and hands-on applications to solidify the concepts covered in lecture.

Textbooks:

Digital Signal Processing Using Matlab Ingle and Proakis

Grades:

Grades will be calculated on the basis of homework/lab assignments (computer-based and analytical), a mid-term exam, and a final exam.

Homework assignments will account for 60% of the grade, a mid-term exam 20%, and a final exam (20%). Lab and lecture will be graded together.

Homework:

Problem Sets

You will be assigned problem sets on Blackboard. The problem sets/labs are due one week after they are assigned. Homework will be due one week from the date assigned and turned in using Blackboard.

Course Topics:

The table below shows the planned topics, readings, and exam schedule. Although I will attempt to stay on schedule, the timing of the scheduled topics will likely change during the semester. I also may be on travel for some lectures. The exam schedule will likely not change.

Table 1: Course Schedule and Course Topics

| Wk. | Date | Lecture | HW Topic | Chapter |
|------------|--------------------|--|---|-----------------|
| 1 | Jan. 21, 23 | Introduction to Class, Computers, Math Review | No lab | Ch.1 |
| 2 | Jan. 28, 30 | Discrete Time Series | Getting Started | Ch. 2 |
| 3 | Feb. 4, 6 | Discrete Time Series | Introduction to Matlab | Ch. 2 |
| 4 | Feb. 11, 13 | Fourier Analysis | Seismograms | Ch. 3 |
| 5 | Feb. 18, 20 | Fourier Analysis | Decimation, Correlation, Convolution | Ch. 3, Ch. 5 |
| 6 | Feb. 25, 27 | Fourier Analysis | Catch up | Ch. 5 |
| 7 | Mar. 3, 5 | Z – Transform | Code Improvement | Ch. 4 |
| 8 | Mar. 10 | Z – Transform, | Fourier Transforms | Ch. 4 |
| | Mar. 12 | Exam 1 | | |
| | Mar. 17, 19 | Spring Break | | |
| 9 | Mar. 24, Apr. 2 | Z – Transform | More on FT | Ch. 4 |
| 10 | Apr. 7, 9 | Filter Structures and Design | Z-Transforms | Ch. 5 |
| 11 | Apr. 14, 16 | Filter Structures and Design | Filters | Ch. 6 |
| 12 | Apr. 21, 23 | Filter Designs | More Filters | Ch. 7 |
| 14 | Apr. 19, 21 | Wavelet Transform | No lab | Ch. 8 |
| 15 | Apr. 28, 30 | Wavelet Transform | WT and the FFT | Ch. 8 |
| 16 | May 5, 7 | Catch up | | |
| 17 | May. 12 (Tues.) | Final Exam (10 AM - 12:45 PM) | | |