

BMME 430
Digital Signal Processing
Course Syllabus

Department: Joint Dept. of Biom. Engr. *Number:* BMME 430 *Credit Hours:* 3
Title: Digital Signal Processing *Elective*

2. Course Description:

This is an introduction to methods of automatic computation of special relevance to biomedical problems. Sampling theory, analog-to-digital conversion, and digital filtering are explored in depth.

3. Prerequisite(s): Comp 14 or equivalent.

4. Textbook(s) and/or other required material:

The Digital Filters and Signal Processing: 3rd Edition. LB Jackson, Kluwer, 1996
The Student Edition of MATLAB, Prentice Hall, Optional

5. Course objectives. By the end of this course, the student should be able to:

1. Represent and analyze discrete time linear signals and systems in the time and frequency domains.
2. Apply the Z-transform and the Discrete Fourier Transform to digital signal processing, including digital filter specification, design and implementation.
3. Appreciate that a system can be represented by various means--difference equation, transfer function, impulse response, zero-pole plot, frequency response (plus order of system)—and be able to obtain all representations from any given representation.
4. Use MATLAB efficiently for signal processing applications.
5. Project the Discrete Fourier Transform of a sampled signal based on knowledge of the Continuous Fourier Transform, including understanding the sampling theorem and the concept of aliasing.
6. Apply the concepts of convolution and correlation.
7. Apply the concepts learned for transient and periodic signals to random data.

6. *Topics covered (number of lectures per topic, based on 28 75-minute lectures):*

1. Overview of Medical Applications of Digital Signal Processing (1)
2. Discrete-Time Signals and Systems (3)
3. The Z transform (3)
4. Input/Output Relationships (3)
5. Discrete-Time Networks (4)
6. Sampling and Fourier Analysis (4)
7. Discrete Fourier Transform (3)
8. IIR Filter Design by Transformations (3)
9. FIR Filter Design Techniques (3)
10. Random Data Processing (1)

7. *Class/laboratory schedule (sessions per week and duration of each session):*

Two 75-minute lectures per week. In addition to homework problems on each chapter, 2-3 quizzes, and a final exam, students are expected to complete a project using real biological signals.

Date of preparation and person(s) who prepared this description:

C. Lucas, October 13, 2005