

EE 415 Digital Signal Processing

Credits: 4

Categorization of credits: engineering topic

Instructor(s): Anders Høst-Madsen.

Textbook and Other Required Materials:

Sanjit K. Mitra: *Digital Signal Processing, A Computer Based Approach*, 3rd Edition, McGraw-Hill, 2006.

Lab Manual, available at: <http://highered.mcgraw-hill.com/sites/0072865466/>.

Designation: Elective

Catalog Description:

Discrete-time signals and systems, sampling, Z-transform, transform, transform analysis of linear time-invariant systems, filter design, discrete Fourier transform, and computation of discrete Fourier transform. Repeatable one time. Pre: 315 and 342 (or concurrent), or consent.

Pre- and Co-requisites: pre: 315 and 342 (or concurrent), or consent.

Class/Lab Schedule: 3 hour lecture/3 hour lab.

Topics Covered:

Varies somewhat by instructor. Currently covered:

- Discrete Time Signals and Systems (2h)
- Difference equations (2h)
- DTFT (1h)
- DFT (2h)
- Z-transform (5h)
- The transfer function (3h)
- Stability (1h)
- Sampling and A/D (2h)
- Filter structures (1h)
- Filter design (4h)
- Sampling rate alteration (2h)
- Polyphase decomposition (1h)

- Filter banks (4h)
- FFT (2h)
- Random signals (3h)

Course Objectives and Relationship to Program Objectives:

Students should be able to (i) understand and analyze DSP problems and (ii) design DSP algorithms to solve DSP problems [Program Objectives 1,2,3,4,5].

Course Outcomes and Their Relationship to Program Outcomes

The course outcomes are closely related to the topics covered

- Understand Discrete Time Signals and Systems [1].
- Understand DTFT, DFT and FFT and be able to analyze systems using these tools [1].
- Understand Z-transform and be able to analyze systems using this tools [1].
- Understand the influence of Sampling and A/D on DSP systems [1].
- Use system specifications to make decisions on filter design, and design filters using computer tools [1, 2, 6].
- Understand and design multirate DSP systems [1, 2, 6].
- Understand random signals [1].

Contribution of Course to Meeting the Professional Component

Engineering topics: 100%.

Computer Usage:

All labs and projects involve use of Matlab.

Design Credits and Features:

EE415 has 2 design credits. Most labs involve writing DSP programs in Matlab. In addition there is major design project, executed in several stages. The project used in past semesters is to design a sub-band codec for speech and music, similar to an MP3 coder.

Person(s) Preparing Syllabus and Date: Anders Høst-Madsen, 3/30/09; Y. Dong, June 14, 2021.