EE-360: Digital Signal Processing

Course Number: EE-360

Course Title: Digital Signal Processing

Course Credits: 3 (3 lectures, 1 tutorial, 0 labs)

Course Description:

Signals and Signal Processing, review of discrete-time signals and systems and the sampling theorem, digital processing of continuous-time signals, decimation and interpolation, the discrete-time Fourier transform, fast Fourier transform, Z-transform, linear time-invariant systems in the transform domain, digital filter structures, digital filter design, and Applications.

Instructors:

Saeed Aldosari, Assistant Professor, Electrical Engineering

Learning Objectives:

The main objectives of this course are to introduce students to the representation and manipulation of discrete-time signals, and to the analysis and design of discrete-time systems.

Text Books:

Sanjit K. Mitra, Digital Signal Processing-A Computer Based Approach, McGraw-Hill, 3rd Edition, 2006, www.mhhe.com/mitra

Reference Texts:

A. V. Oppenheim, R. W. Schafer, and J. R. Buck, Discrete-Time Signal Processing, Prentice-Hall, 2nd Edition, 1999.

Prerequisites: EE 301: Signal and System Analysis.

Topics:

Topic	Weeks
Review: Characterization and classification of discrete-time signals and systems; Typical signal processing operations; Discrete-time linear time-invariant (LTI) systems; Linear constant-coefficient difference equations; Frequency-domain representation of discrete-time signals and systems, The sampling theorem.	2
The discrete Fourier transform (DFT)	2
The z-transform	2
LTI systems in the transform domain: linear phase systems, allpass systems, design and analysis of basic low-order digital filters	2
Digital Filter Structures	1
Infinite-impulse response (IIR) digital filter design	2
Finite-impulse response (FIR) digital filter design	1
Fundamentals of multirate digital signal processing: decimation and interpolation	1

Class/Tutorial Schedule:

Class is held three times per week in 50-minute lecture sessions. There is also a 50-minute weekly tutorial associated with this course.

Grading:

10 % Homework

20 % First mid-term exam

20 % Second mid-term exam

10 % Class participation + Project

40 % Final Exam

Outcome Coverage:

(a) Ability to apply knowledge of mathematics, science, and engineering

This course is concerned with the representation, manipulation, and transformation of signals and systems, which require the use of various mathematical tools such as convolution, Fourier analysis, and z-transform.

(c) Ability to design a system, component, or process to meet desired needs within realistic constraints.

After covering the necessary time-domain and frequency domain tools, the second part of this course focuses on the use of these tools to design digital filters that achieve certain objectives. The role of realistic constraints is emphasized by showing how the various design parameters affect the digital filter size and implementation complexity, and the impact on system cost and size.

(e) Identify, formulate and solve engineering problems.

This course includes a project where the students are asked to identify and formulate an engineering problem, and to propose the appropriate solution using the tools covered in this course such as digital filter design techniques.

(k) Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice..

Throughout this course, students learn how to make use of MATLAB to perform various design and analysis tasks. Some assignments and projects also require the use of MATLAB, and the FDATOOL filter design tool.