No: ECE 5770

Title: Digital Signal Processing

Credit: 4

WSU Catalog Description:

Prerequisite: ECE 4700

Coordinator: Ali Tajer, Assistant Professor of Electrical & Computer Engineering
Instructor: Ali Tajer, Assistant Professor of Electrical & Computer Engineering
Office Hours: Monday & Wednesday 4:00pm-5:00pm
Office Location: Room 3125, Engineering Building
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Course Meeting Time: Monday & Wednesday 5:30pm-7:20pm
Course Meeting Location: 9 Manoogian Hall

Goals: To understand discrete-time signals and systems, develop capabilities in analysis and design of discrete-time signal processing systems, including sampling, interpolation, analysis of discrete-time systems in time/frequency domains, filtering, convolution, z-transform and discrete Fourier transform, and apply DFT to the latest communications systems.

Learning Objectives: At the end of this course, students will be able to:

1. Recognize linear time-invariant (LTI) discrete-time systems

2. Describe sampling, practical sampling, upsampling, interpolation; Apply the Nyquist theorem to band-limited signals

3. Find frequency response of LTI system, find zeros and poles in discrete-time LTI system

4. Design IIR filters using impulse invariance, design FIR filters using windowing
Text:


References:


Exams: 2 Mid-terms & Final (all closed-book; 1 one-sided A4 cheat sheet allowed)

Exam Schedule:

1. Midterm 1: October 03, 2012
3. Final: December 17, 2012

Grading:

Assignments $\times 20\%$ + Project $\times 10\%$ + Midterm 1 $\times 20\%$ + Midterm 2 $\times 20\%$ + Final $\times 30\%$

Collaborations: Students can discuss possible solutions to the assignments. Every student is required to write up the final form of his/her submission entirely on his/her own.

Computer skills: Knowledge of Matlab or C/C++ required

Course Outline:

1. Introduction to signals and systems
2. Discrete-time signals
3. Discrete-time systems
4. The Z transform
5. Frequency domain analysis
6. Filters
7. Discrete Fourier transform
8. Fast Fourier transform
Outcome coverage:

1. Ability to apply knowledge of mathematics, science, and engineering: The exercises/projects/exams in the course require direct application of mathematical, scientific, and engineering knowledge for signal and system analyses. Students are required and trained to perform Fourier transform, Z-transform, DTFT, and integrations, in a professional way and many supporting and follow-up calculations.

2. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability: The projects require students to do research and find the right solutions and chips to achieve system specifications. Design concepts and procedures are taught, discussed and checked against current practices in industry.

3. Ability to identify, formulate, and solve engineering problems: The course requires students to understand foundations in discrete-time signals/systems and processing of digital signals. Through lecturers, homeworks and projects linked with the state-of-the-art industrial applications, students are trained to convert analog signals to discrete-time signals, process them, and then convert discrete-time signals to analog signals, completing the entire cycle of DSP in industry.

4. recognition of the need for, and an ability to engage in life-long learning: Students should understand DSP is a basic tool in modern electrical/computer engineering. DSP is widely used in audio systems, cellular phones, and medical equipment, etc. Fundamental concepts and systems taught in this course enable students to continue to learn new concepts and knowledge in a variety of areas by themselves.

5. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice: Students will be able to use mathematical skills for signal analyses, system evaluation, and general calculations. They are required to use computer software packages including Matlab, C/C++, to design and analyze the performance of DSP modules.

Cheating Policy and Penalty for Cheating: Cheating is defined by the University as intentionally using or attempting to use, or intentionally providing or attempting to provide, unauthorized materials, information, or assistance in any academic exercise. This includes any group efforts on assignments or exams unless specifically approved by the professor for that assignment or exam. Evidence of fabrication or plagiarism, as defined by the University in its brochure Academic Integrity, will also result in downgrading for the course. Students who cheat on any assignment or during any examination will be assigned a failing grade for the course.
Accommodations for Students with Disabilities: If you have a documented disability that requires accommodations, you will need to register with Student Disability Services for coordination of your academic accommodations. The Student Disability Services (SDS) office is located at 1600 David Adamany Undergraduate Library in the Student Academic Success Services department. SDS telephone number is 313-577-1851 or 313-577-3365 (TDD only). Once you have your accommodations in place, I will be glad to meet with you privately during my office hours to discuss your special needs. Student Disability Services mission is to assist the university in creating an accessible community where students with disabilities have an equal opportunity to fully participate in their educational experience at Wayne State University.

Prepared By: Ali Tajer, Assistant Professor of Electrical and Computer Engineering