ECE 1560: Digital Signal Processing

FALL, 2024

COURSE DESCRIPTION

This course offers a comprehensive theoretical background in data acquisition and digital signal processing, with a focus on computer-based measurement systems. Students will explore the representation, analysis, and design of discrete-time signals and systems. Key topics include sampling, implementation of discrete systems, the fast Fourier transform (FFT) algorithm, frequency analysis, and the analysis of discrete systems through poles and zeros. The course also covers discrete-time random signals and hypothesis testing, equipping students with the skills needed to analyze and process signals in various digital applications.

INSTRUCTOR

Hao Qin, Room 527
Email: hao.qin@scupi.cn
Office Hours: Monday 2-6 pm, Tuesday 9-12 am, or by appointment

TEACHING ASSISTANT

Han Jixian, email: 1242379608@qq.com

LECTURES

Wednesday 8:15-11:00, 4-216. In-person attendance is required for all class meetings.

RECITATION

Wednesday 12:00-14:00, location TBA

TEXTBOOK

Luis F. Chaparro: Signals and Systems Using MATLAB

COURSE OBJECTS AND LEARNING OUTCOMES

In this course, you will be expected to:

- Develop a solid theoretical foundation in digital signal processing and data acquisition.
- Gain proficiency in the representation and analysis of discrete-time signals and systems.
- Learn to design and implement digital filters and other DSP systems.
- Understand the use and application of the Fast Fourier Transform (FFT) in frequency analysis.
- Explore the analysis of discrete systems using poles, zeros, and frequency response.
- Apply DSP techniques to real-world problems in various fields
- Become proficient in using software tools like MATLAB for signal analysis and processing.

COURSE REQUIREMENTS AND GRADING

There will be homework assignments, quizzes, a designed project, and two exams.

- Homework: 20%
- Quizzes: 10%
- Design Project: 20%
- Midterm Exam: 20%
- Final Exam: 30%

HOMEWORK

Homework assignments and their due dates will be given in the lectures. All work should be clearly presented, showing all steps to demonstrate your understanding of the process. While collaboration with classmates is encouraged, the final submission must be your own independent work, and plagiarism is strictly prohibited. **No late homework** will be accepted.

QUIZZES

There will be short quizzes given during the class meetings. Quizzes are designed to test basic skills and prepare you for the exams.

DESIGN PROJECT

You will generally work in groups of 4 or 5 on a project. Students will undertake a design project that involves both the simulation and implementation of a digital signal processing (DSP) system. The project requires developing an optimal solution to a detection or estimation problem, utilizing observations modeled as a discrete-time random process. The Fourier transform will play a central role in the solution, serving as a key tool for analyzing and processing the signal data. This project will allow students to apply theoretical concepts learned in the course to a practical, real-world DSP problem, demonstrating their ability to design and implement complex signal processing systems.

EXAMS

There is a midterm exam and a final exam. Each test will focus on the material presented since the previous exam, while also having the potential to include content from earlier sections. Attendance at all exams is mandatory. Make-up exams will only be given in the event of an emergency and only if advance notification is provided.

ACADEMIC INTEGRITY

Maintaining academic integrity is essential in this course. All work submitted must be your own, whether individual or group assignments. Plagiarism, cheating, or any form of dishonesty will not be tolerated and will result in disciplinary action as per the institution's policies. You are encouraged to collaborate with classmates on understanding concepts, but all submitted work must reflect your independent effort. Properly cite any sources or assistance received and uphold the highest standards of academic honesty in all your work.

TENTATIVE PROGRESS

Week	Topic Sections	Notes
1	1.1 – 1.4	
2	2.1-2.5	
3	Review Ch.1 and Ch.2 3.1 – 3.4	
4	3.5 – 3.8	
5	Review Ch.3 4.1 – 4.5	
6	5.1 – 5.4	
7	5.5 – 5.8	
8	Review Ch.4 and Ch.5	
9	7.1 – 7.2	

10	7.3	
11	8.1 – 8.2	Midterm Exam
12	9.1 – 9.3 Review Ch 7-9	
13	10.1 – 10.4	
14	10.5 – 10.6	
15	11.1 – 11.4	
16	Review Ch.10 and Ch.11	
17	12.1 – 12.3	
18	12.4 – 12.6 Review Ch.12	
		Final Exam