

EE 424

Discrete Time Signal Processing

Fall 2013

Instructor: Dr. S. Serdar Kozat

Office: Elec-309
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Recitation: Check your schedule.

Course Description

Review of discrete-time Fourier transform and sampling theory. The Discrete Fourier Transform (DFT) and FFT, Fourier analysis of signals using the FFT, spectral estimation and windows. The Z-transform, digital filtering, structures for digital filters, FIR filter design methods, IIR filter design methods. Multi-rate DSP, interpolation and decimation filtering, poly-phase representations and filterbanks.

Textbook

Discrete-Time Signal Processing, (at least) Second Edition;
Alan V. Oppenheim, Ronald W. Schaffer, with J. R. Buck; Prentice Hall, 1999.
Check the website for the other reference textbooks.

Exam schedule and grading

Exam schedule:

Midterm 1	TBA
Midterm 2	TBA
Final	TBA

The final exam will be inclusive of all material covered during the semester.

Course grade will be calculated according to

Midterm 1	22%
Midterm 2	23%
Final	40%
Hws+qzs+bonus project	15%

Topics to be covered in Class

Subject	Reading
DT Signals and Systems	Sec. 2.1-2.5
DTFT	Sec. 2.6-2.9
Sampling, DT Processing of CT Signals	Sec. 4.1-4.3
Sampling in the Frequency Domain	Sec. 4.4, 4.8
DFT	Sec. 8.1-8.5
Properties of DFT	Sec. 8.6
Linear Convolution using the DFT	Sec. 8.7
FFT Algorithms	Chap. 9
Spectrum Analysis: Effect of Windowing	Sec. 10.1, 10.2
Short-Time Fourier Transform	Sec. 10.3-10.5
Spectrum Analysis	Sec. 10.6, 10.7
Z-Transform and ROC	Sec. 3.1-3.2
Properties of the Z-Transform	Sec. 3.4
Inverse Z-Transform	Sec. 3.3
Analysis of DT LTI Systems	Sec. 5.1-5.3
Relationship between Magnitude and Phase	Sec. 5.4-5.6, 11.3
Generalized Linear Phase	Sec. 5.7
FIR Filter Design: Window Method	Sec. 7.2, 7.3
Optimal FIR Filter Design	Sec. 7.4, 7.5
Optimal FIR Filter Design	
Continuous-Time (Analog) Filters	Appendix B
IIR Filter Design by Transformation	Sec. 7.1
Implementation of FIR and IIR Filters	Chap. 6
Multirate DSP: Decimation	Sec. 4.6, 4.7
Multirate DSP: Interpolation	
Polyphase Decompositions	
Oversampled D/A, A/D, and noise shaping	Sec. 4.9

Homeworks

Homeworks aim to help students practice the theory covered in class, expose them to more complex problems, and write MATLAB code for practical applications. Students must be prepared to spend at least **six (6) hours per week** to do homeworks.

Each student must prepare homeworks **alone**. Working together, showing complete or incomplete solutions to your friends, and file sharing or transfer is strictly prohibited. Students who are suspected of any of these activities will be sent to the *University Disciplinary Committee* immediately, without any previous warning. See the section on Academic Honesty. Help may only be sought from the TA **during his/her office hours**.

ALL MATLAB homeworks **MUST** be submitted in order to pass the course. Late homeworks **MAY** be accepted, but no credit will be given.

Attendance

Students must attend all lectures and recitations. Attendance will be collected in every class and recitation. Students who fail to attend at least two-thirds of all lectures and two-thirds of all recitations will receive the grade of “F” automatically.

Academic Honesty

Academic dishonesty is a serious violation of the trust upon which an academic community depends.

The students must submit their own work in all exams, quizzes, and homeworks.

- ❑ In exams and quizzes, all forms of information exchange and talking between students is forbidden. Obtaining an exam prior to its administration or use of unauthorized material during an exam are also acts of academic dishonesty.
- ❑ In homeworks, working together, showing complete or incomplete solutions to your friends, and sharing or transfer of files is strictly prohibited.
- ❑ Assisting someone else to engage in an act of academic dishonesty is also considered as an act of academic dishonesty.

Students who are involved in any act of academic dishonesty will be sent to the Disciplinary Committee immediately, without any warning. The penalties may range from failing the class, to expulsion from the University.