Electrical and Computer Engineering Course Syllabus

Instructor:	Prof. Henry Pfister	**E-mail:**	hpfister@tamu.edu
Office / Hour:	WERC 235A / M 4-5 pm	**Phone:**	(979) 862-3198
Class Room:	ZEC 223A	**Class Time:**	T-TH 5:30-6:45 PM

Course Name: **ECEN 444**

Course Title: **Digital Signal Processing**

Prerequisite(s): ECEN 314

Required Text(s): Digital Signal Processing by J. Proakis and D. Manolakis, Prentice Hall, 4th Ed.

Course Objectives:

1. Explore fundamental concepts of digital signal processing including discrete-time signals, frequency-domain representation, filtering, and applications.
2. Introduce the z-transform and discuss its properties and applications.
3. Discuss the sampling and reconstruction of continuous-time signals and the relationship to digital signal processing.
4. Develop more advanced notions of Fourier transforms including the discrete Fourier Transform, the fast Fourier transform, and the short-time Fourier transform.
5. Introduce discrete-time filtering including standard filter realizations and standard filter design techniques.
6. Acquire the ability to recognize, formulate and solve digital signal processing problems using a high-level programming languages such as MATLAB.
7. Discuss multirate signal processing techniques such as decimation and interpolation.
8. Engage the student in an active learning experience. Expose the student to search engines and scholastic resources. Prepare the student to become an active contributor to the common body of knowledge.

Course Topics and Hours:

Unit	Topics	Hours
1	Overview of DSP	1.5
2	Signals and Systems Review	1.5
3	Fourier Transform (FT) and Series	4.5
4	Discrete-Time (DT) Systems	6
5	The Z-Transform	6
6	Frequency Response of DT Systems	4.5
4	Sampling and Reconstruction	3
7	Discrete FT (DFT) and Fast FT (FFT)	6
8	Filter Structure and Design	6
9	Spectral Analysis	3
10	Multirate Signal Processing	3
	Total Hours	45

Lecture Schedule: 2 meetings / week, 125 minutes total

Student Evaluation:

Homework	25%	Weekly assignments due each Tuesday after they are assigned
Midterm	20%	One midterm on Wednesday, March 11 from 7:00-9:00 pm
Final Exam	35%	Comprehensive final exam on Wednesday, May 13 from 3:30-5:30 pm
Projects	20%	Multiple MATLAB projects throughout the semester

Rules and Guidelines:

The class shall follow all established policies of TAMU. This includes the Aggie Honor Code and the Americans with Disabilities Act (ADA). The honor code is "An Aggie does not lie, cheat, or steal or tolerate those who do." and more information is available from `http://www.tamu.edu/aggiehonor`. The ADA is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities and more information is available from `http://disability.tamu.edu`. Links to these and other policies can be found at `http://www.ece.tamu.edu/~hpfister/courses.html`.

Course Outline

Week	Sections	Topic (Slides Lecture #)	Notes
1	1.1-1.3, 2.1	Overview of DSP and Signals/Systems Review (1-2)	HW1: 1.1, 1.3, 1.6, 2.4, 2.5
2	4.1-4.2.5	Fourier Series and Transforms (3,5)	HW2: 4.1, 4.2, 4.3, 4.5
3	4.3-4.4 2.2-2.3	Properties of Fourier Analysis and Discrete-Time Systems (5,7,8)	HW3: 2.8abc, 2.10-2.11, 2.16b(3,6,9), 4.6cd, 4.9ad
4*	2.4	Difference Equations (9,10) (Guest Lectures)	HW4: 4.7, 4.8, 4.14, 4.17, 2.26, 2.27
5	2.5-2.6 3.1-3.2	Basic LTI Structures, Correlation, and the Z-Transform (11,12)	HW5: 2.28, 2.31, 2.33, 2.35, 2.37, 2.43
6	3.3-3.4	The Z-Transform: Inverse and Applications (13,14)	HW6: 2.47, 2.51, 2.54, 2.64, 3.1, 3.3, 3.7
7	3.5, 4.2.6	The Z-Transform: Poles, Zeros, and Frequency (15,16)	HW7: 3.2bdg, 3.11, 3.13, 3.14bdf, 3.16bc, 3.18, 3.31
8	5.1,5.2,5.4	Frequency Response of LTI Systems (+)	Midterm
9	6.1,6.2	Sampling and Reconstruction (29,30,31)	HW8: 5.1cd, 5.2, 5.6, 5.7, 5.9b, 5.26
10	4.2.3, 4.3, 7.1-7.3	The Discrete Fourier Transform and its Properties (17,19)	HW9: 6.1bd, 6.3, 6.8, 6.13, 6.15, one of (5.52,5.80abc,5.82)
11	8.1-8.2	The Fast Fourier Transform (18,+)	HW10: 7.2b, 7.8,7.9, 7.13, 7.21
12	7.4	Short-Time Fourier Transform and Time-Frequency Analysis (33,34)	HW11: 8.10, 8.13, 8.16, 8.24, 8.25, 8.26
13	9.1-9.2.3. 10.1	Filter Structures and FIR Filter Design (20,21)	HW12: 9.3, 9.4, 9.5, 10.1, 10.2
14	10.1-10.2	IIR Filter Design (21,22)	Practice: 10.10 (try bilinear and impulse invariance)