School of Engineering + Technology
EE424 - Digital Signal Processing
Spring 2020
Belk 253 – MW 8:00 am-8:50 am

Instructor Information

Instructor: Dr. Yeqin Huang
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Catalog Description

Theory and algorithms for processing of discrete-time signals. Topics include discrete-time signals and systems, discrete Fourier transform, Z-Transform, fast Fourier transform, and discrete-time filters.

Prerequisites: EE 351 with a grade of C or better.
Credits: 3

Course Aims and Objectives

The goal of this course is to provide the students with an understanding of the traditional topics associated with digital signal processing, e.g. discrete-time signals and systems, discrete-time transforms, and linear filtering. The computer simulation exercises are intended to familiarize the students with the aspects of implementation and application of theoretical knowledge to practical problems. Upon completion of the course, the student will be able to accomplish the following:

1. Demonstrate an understanding of discrete-time transforms and systems.
2. Understand and apply theoretical knowledge to design FIR and IIR filters.
3. Be able to use Matlab for signal analysis and filter design.
4. Apply DSP theory and skills to engineering problems in line with IEEE Stndards.

As part of the ongoing continuing improvement process for ABET accreditation, this course is assessed regularly for the following student performance indicators. Students' work might be copied and shared with accreditation visitors. Personal information will be removed.

PI 1.1.1: The student shall be able to apply mathematical principles and models to solve complex engineering problems.
PI 1.2.1: The student shall be able to demonstrate problem solving strategies that incorporate pertinent principles of science to complex engineering problems.
PI 1.3.1: The student shall be able to apply engineering principles to solve complex engineering problems.
PI 1.4.1: The student will be able to identify a complex engineering problem through a preliminary investigation.
PI 1.5.1: The student shall be able to identify constraints in a complex engineering problem and formulate a logical plan while identifying connections between subsystems of the problem.
PI 1.5.2: The student shall be able to demonstrate the connection between theory and practical solution.
PI 1.6.1: The student shall be able to demonstrate logical problem solving methods and synthesize information to solve a complex engineering problem.

Course Materials

Required Text: John G. Proakis and Dimitris K Manolakis, Digital Signal Processing, 4th Edition, Pearson, 2006. ISBN: 0131873741
References: Vinay K. Ingle and John G. Proakis, Digital Signal Processing Using MATLAB, 2nd Edition, CL-Engineering, 2006. ISBN: 0495073113.

Technology: Laptop and MATLAB.

Grading

The following percentages will be used to determine the final grades.

- Homework 20%
- Two Tests 30%
- Quiz 20%
- Final Exam 30%

Grades will be awarded based on the following scale:

Numerical Course Average	Grade Assigned	Numerical Course Average	Grade Assigned
97-100	A+	72 - 77	C
92 – 96	A	70 – 71	C-
90 – 91	A-	68 – 69	D+
88 – 89	B+	62 – 67	D
82 - 87	B	60 - 61	D-
80 – 81	B-	0 - 59	F
78 – 79	C+		

Tentative Schedule

Week	Topic
01	Discrete-time signals Signal operations, signal energy and power
02	Disccrete-time systems Classification of systems
03	LTI systems, Convolution Discrete-time Fourier Transform
04	Properties of DTFT LTI system analysis in frequency domain
05	Sampling theorem Z-Transform
06	Properties of Z-Transform System analysis in the Z-domain
07	Review **TEST 1**
08	Discrete Fourier series Discrete Fourier transform
09	Properties of DFT Fast Fourier Transform
10	IIR filter structures IIR filter design
11	Application examples of IIR filters Application examples (cont'd)
12	FIR filter structures FIR filter design
13	Application examples of FIR filters Application examples (cont'd)

14	Review
	TEST 2
15	Review
	Review
16	Final

Faculty Expectations of Students/Course Policies

Attendance:
Students are required to attend all lectures. In the event that a student must miss a class they should inform the instructor and be able to provide ample evidence to justify the absence.

Timely Submissions:
Typically assignments must be submitted on time or they will receive a grade of zero. The instructor MAY exercise discretion in the instance a student can demonstrate extenuating circumstances.

Expectations for Submitting Required Work:
Work will be completed to professional standards. Hand written work must be written legibly. Digital submissions will be done for some assignments.

Technology:
The School of Engineering + Technology requires that all students have a laptop computer capable of running standard software and accessing the internet. Many of the applications can be accessed without installation using virtual.wcu.edu. Mobile devices, such as phones, cannot replace a laptop.

Student Resources

Writing and Learning Commons (WaLC):
The Writing and Learning Commons (WaLC), located **in BELK 207**, provides free course tutoring, writing tutoring, academic skills consultations, international student consultations, and online writing and learning resources for all students. To view schedules and make appointments for any of these services, visit tutoring.wcu.edu or call 828-227-2274.

Math Tutoring Center:
The Mathematics Tutoring Center (MTC) in Stillwell 455 provides drop-in tutoring for math courses and math-related content across the curriculum, workshops on study skills specific to math courses, and graduate and professional exam preparation resources. Tutoring is available on a drop-in basis, MTWR 9:00am-9:00pm and Friday 9:00am-5:00pm. For more information, please visit http://mtc.wcu.edu/ or contact us at 828–227–3830.

Hunter Library:
Hunter Library provides students with access to group and individual study spaces and to thousands of information resources: print and electronic books, newspapers, and scholarly journal articles.
These resources can be searched online and often accessed there (http://www.wcu.edu/hunter-library) or library staff and subject specialists skilled in their specific disciplines can be contacted via the library's research guides (http://researchguides.wcu.edu/).

Blackboard Support:
The learning management system for this class is Blackboard and can be found at http://wcu.blackboard.com
Additional help with Blackboard can be found at tc.wcu.edu, (828) 227-7487 or by visiting the Technology Commons located on the ground floor of the Hunter Library.

Academic Toolbox:
The Academic Toolbox is available in all WCU courses via the course Blackboard site. It can be found in the left-hand side column. The Academic Toolbox contains information and contact information for nearly all of the resources needed by WCU students, including but not limited to: technology assistance, academic services, student support, co-curricular programs and university policies.

Academic Calendar
This includes dates for all breaks, university closures, final exams, etc. The academic calendar can be found at http://www.wcu.edu/learn/academic-calendar.asp

Final Exam
The university final exam schedule can be found at http://www.wcu.edu/learn/academic-services/registrars-office/

Syllabus Updates

This syllabus, along with its course schedule, is based on the most recent information about the course content and schedule planned for this course. Its content is subject to revision as needed to adapt to new knowledge or unanticipated events. Updates will remain focused on achieving the course objectives and students will receive notification of such changes. Students will be notified of changes and are responsible for attending to such changes or modifications as distributed by the instructor or posted to Blackboard.

Academic Integrity Policy and Reporting Process

This policy addresses academic integrity violations of undergraduate and graduate students. Graduate students should read inside the parenthesis below to identify the appropriate entities in charge of that step of the process.

Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of the Academic Integrity Policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community. While academic in scope, any violation of this policy is by nature, a violation of the Code of Student Conduct and will follow the same conduct process (see ArticleVII.B.1.a.). If the charge occurs close to the end of an academic semester or term or in the event of the reasonable need of either party for additional time to gather information timelines may be extended at the discretion of the Department of Student Community Ethics (DSCE).

General:
This policy addresses academic integrity violations of undergraduate and graduate students. Students, faculty, staff, and administrators of Western Carolina University (WCU) strive to achieve the highest standards of scholarship and integrity. Any violation of this policy is a serious offense because it threatens the quality of scholarship and undermines the integrity of the community.
Instructors have the right to determine the appropriate academic sanctions for violations of the Academic Integrity Policy within their courses, up to and including a final grade of "F" in the course in which the violation occurs.

Definitions:
Cheating – Using, or attempting to use, unauthorized materials, information, or study aids in any academic exercise.
Fabrication – Creating and/or falsifying information or citation in any academic exercise.
Plagiarism – Representing the words or ideas of someone else as one's own in any academic exercise.
Facilitation – Helping or attempting to help someone to commit a violation of the Academic Integrity Policy in any academic exercise (e.g. allowing another person to copy information during an examination).

Undergraduate and Graduate Academic Integrity Process:
Additional information is available on the Student Success website under Student Community Ethics: http://www.wcu.edu/experience/dean-of-students/academic-integrity.aspx