EE3353: DISCRETE-TIME SIGNALS AND SYSTEMS
SYLLABUS FOR SPRING 2019 (Draft Ver. 1, 1/18/2019)

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OFFICE HRS.: (tentative)
Tuesday & Thursday 11:30 AM – 12:25 PM
Monday & Wednesday 1:30 – 2:00 PM (after EEDIP class)
Friday (unless other meetings conflict) 11-12 noon (send e-mail or call before)

CLASS TIME, PLACE: M & W 4:30 PM – 5:50 PM in CRBL C205

TEXTBOOK: SIGNALS, SYSTEMS AND TRANSFORMS, ***FIFTH EDITION*** by C. L. Phillips, J M. Parr, and E. A. Riskin, Prentice-Hall, 2014. Use of earlier editions is OK but you are responsible for tracking any differences and the accuracy of section and problem numbers from the textbook.
This is the book URL with useful material: *http://www.ee.washington.edu/class/SST_textbook/textbook.html*

PREREQUISITE: EE2353 Analog Signals and Systems, including: (1) Definition, manipulation and properties of continuous-time signals and systems; (2) Linear Time-Invariant (LTI) systems and the convolution integral; (3) Fourier Series, Fourier Transform, and Laplace Transform (from co-requisite course Circuits II). Familiarity with the Matlab software package is very helpful but it will not be assumed (it will be developed quickly in this course by running and modifying existing scripts/code and by studying the code from class demos).

COURSE OVERVIEW: Introduction to the concepts and tools of the discrete-time (D-T) theory of signals and systems to parallel and expand on previous concepts from the continuous-time case. Initially, the emphasis will be on time-domain analysis of linear, time-invariant (LTI) systems, the role of D-T convolution and difference equations. Transform-domain LTI system analysis and design will be approached using the z-transform and D-T Fourier transforms. The use of digital filters will be illustrated as a general approach to process signals in modern applications. Similarly, DFT-based spectrum analysis will be introduced as a major tool for the analysis of the frequency contents of signals. In general, this course will continue to prepare students for Senior (and graduate) level courses in Controls, Communications and Signal and Image Processing. Matlab assignments and projects will give students more hands-on experience with discrete-time signals and systems concepts and a few applications.

COURSE GRADING

• In-class Semester Exams (2 in-class exams, open paper copy books or self-prepared notes)	**45% (*or 25%)**
• Homeworks, Matlab Projects	**10% (*same 10%)**
• Quizzes and **iClicker participation**	**15% (*same 15%)**
• Comprehensive Final Exam, during Final Exams week	**30% (*or 50%)**
TOTAL	**100%**

*** Alternative weighting used only if it gives you a higher grade (this sometimes helps a few students improve one grade level if they are on the borderline between two grades)**

KEY DATES:

Exam 1 *tentative* date:	February 25 (Monday) or later
Exam 2 *tentative* date:	April 15 (Monday) or later
Exam 3 actual date:	Final Exam week (May. 13-17)

USE OF E-MAIL: Each student is required to read their officially registered UTEP e-mail account often enough to monitor ongoing information related to this course. All assignments will be sent via e-mail. Treat e-mail correspondence as a professional exchange of information. Use an accurate "Subject" and never "reply to all" when an e-mail is sent to the whole class. For **Spring 2019**, **Blackboard** may replace the use of direct e-mail.

COMPUTER USAGE: The MATLAB software package (with many Toolboxes) is made available via download or a DVD or direct install on your laptop to all Engineering Students from the Engineering Technology Center (ETC) Engineering building E351D (3rd floor between CRBL and Eng. Bldg.) **http://etc.utep.edu/**
Tel. (915)747-5223, E-mail: **etchelpdesk@utep.edu**

TOPICS TO BE COVERED (the exact order, pages and/or sections and subsections will be listed in homework handouts and/or will be sent via e-mail).

I- Preliminaries, Introduction and Software
- I- Samplers and discrete-time physical systems (Sect. 1.3, please read on your own)
- II- Intro. to Matlab and Simulink (Sect. 1.4, please read on your own)

II- Discrete-Time (D-T) Signals and Systems (Chapter 9).
- a) Axis and amplitude transformations and basic signal properties
- b) Basic, important D-T signals including D-T sinusoids
- c) Definition and properties of discrete-time systems

III- Discrete-Time Linear, Time-Invariant (LTI) Systems (Chapter 10)
- a) Impulse response and D-T convolution for LTI systems
- b) Properties of D-T LTI systems
- c) Iterative solution of Difference Equations (DEs) and LTI Difference Equations
- d) Difference Equation (DE) models, block diagrams

IV- The z-Transform (Chapter 11 and supplements)
- a) Definition and evaluation of unilateral z-transforms of basic causal signals
- b) Unilateral z-transform properties and inverse z-transform
- c) LTI systems analysis and D-T convolution using the unilateral z-transform.
- d) Solution of LTI DEs using unilateral z-transforms
- e) Intro. to bilateral z-transform, region of convergence, non-causal signals, etc.

V- Discrete-Time Fourier Transform (DTFT) and Discrete Fourier Transform (DFT) (Sects. 5.4, 6.4 Chap. 12 & supplements)
- a) Review Sampling theory relating to Continuous-Time Fourier Transform
- b) DTFT Definition and basic transform pairs
- c) Properties of the DTFT and relationship to bilateral z-transform
- d) Discrete-time processing of continuous-time signals (handout)
- e) The Discrete Fourier Transform (DFT) and its computation using Fast Fourier Transform (FFT) algorithms
- f) Application of the DFT to perform convolution
- g) Windowing and spectrum analysis using the DTFT and the DFT.

VI- Digital Filtering based on LTI Systems (in parallel with Chapters 10-12 mostly using Matlab projects)
- a) Response of LTIs systems to sinusoidal inputs.
- b) Frequency response of Finite Impulse Response (FIR) LTI systems
- c) Frequency response of DE based, Infinite Impulse Response (IIR) LTI systems.
- d) Applications of LTI digital filtering: signal separation, noise removal, etc.

EFFORT, PARTICIPATION and ETIQUETTE:

- Students (domestic or international, no exceptions) that are clearly not doing the homeworks, are failing quizzes, and who fail Exam 1 will be dropped from the course unless there are extenuating circumstances (let's discuss it).
- Come to class and show up on time. Habitual late comers may not be allowed in class without a justification.
- Leaving early is considered disruptive and unprofessional, it should be kept to a minimum. Inform the instructor ahead of time if you must leave early and sit near the door to minimize disruptions.
- Ask questions of broad interest, your fellow students will also benefit.
- Bring your book and **laptop/smartphone to class to participate in iClicker use**.
- Turn down the sound on cell phones, beepers, i-pods, etc. during the class period.
- The use of cellular phones during exams and quizzes is strictly prohibited, put them away and out of reach.
- Do not bring ***smelly food*** into the classroom unless you are willing to share with me and everyone else that will suddenly become hungry! Eating other things during class should be done very quietly and as a last resort.

ACADEMIC INTEGRITY

Please review the statements below and UTEP's Web page on Policy on Academic Integrity at:
http://sa.utep.edu/osccr/academic-integrity/

Academic dishonesty is prohibited and is considered a violation of the UTEP Handbook of Operating Procedures. It includes, but is not limited to, cheating, plagiarism, and collusion. Cheating may involve copying from or providing information to another student, possessing unauthorized materials during a test, or falsifying research data on laboratory reports. Plagiarism occurs when someone intentionally or knowingly represents the words or ideas of another person's as ones' own. And, collusion involves collaborating with another person to commit any academically dishonest act. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. Violations will be taken seriously and will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.

Academic dishonesty is an assault upon the basic integrity and meaning of a University. Cheating, plagiarism, and collusion in dishonest activities are serious acts which erode the University's educational and research roles and cheapen the learning experience not only for the perpetrators, but also for the entire community. It is expected that UTEP students will understand and subscribe to the ideal of academic integrity and that they will be willing to bear individual responsibility for their work. Materials (written or otherwise) submitted to fulfill academic requirements must represent a student's own efforts. Any act of academic dishonesty attempted by a UTEP student is unacceptable and will not be tolerated. Violations will be referred to the Dean of Students Office for possible disciplinary action. Students may be suspended or expelled from UTEP for such actions.