

University of Texas at El Paso
 Electrical and Computer Engineering Department
EE 3353: Discrete-Time Signals and Systems
 Spring 2023 -Syllabus

Instructor:	Martha Torres
Email:	mltorreslozano@utep.edu
Virtual Office Hours:	9:00am – 11:00am Wednesday Or by appointment (justification is required)
In -Person Office Hours	2:00pm – 4:00pm Monday and Wednesday Or by appointment (justification is required)
Sessions Day/Time:	Monday , Wednesday 4:30 pm – 5:50 pm CRN 27815 (In-Person)
Textbook :	<i>DSP First, Second Edition</i> by James H. McClellan, Ronald Schafer, and Mark Yoder, Pearson, 2016 (use of earlier editions is NOT recommended, there are too many differences). This is the companion Web site: https://dspfirst.gatech.edu/ The textbook is available through the UTEP Bookstore. To buy the e-book directly from the publisher visit: https://www.pearson.com/us/higher-education/program/Mc-Clellan-DSP-First-2nd-Edition/PGM86857.html
Room:	PSCI 314 / Blackboard Collaborate
Prerequisites:	EE2350 Electric Circuits 1 and CS1320 both with a minimum grade of “C”.
Prerequisites by Topic	Calculus and differential equations; complex numbers and functions; basic time-domain and steady-state circuit analysis; basic familiarity with MATLAB software tools.

CATALOG DESCRIPTION: Representation and analysis of discrete time signals and systems, digital filtering, sampling, spectrum analysis, Z-transform, DT Fourier transform, and the DFT. Emphasizes computer simulations and some basic applications to communications, control and signal processing.

COURSE DELIVERY AND OVERVIEW: The class is starting 100% in-person with support and enhancements using Blackboard (BB). Quizzes and exams will begin as in-person, face-to-face or take-home assignments. The companion Web site of the textbook is very extensive, make sure to access it as soon as possible.

First there is review of basic topics related to real and complex exponentials (AKA complex sinusoids) and sums and other basic combinations of sinusoids. The phasor concept is re-visited from Circuits to relate real and complex sinusoids. For sums of sinusoids, a graphical complex spectrum representation is presented and illustrated. Basic time-domain signal transformations and their effect on the spectrum are discussed. A brief introduction to Fourier Series is presented as a special case of sums of sinusoids but it is not covered in depth, that is done in EE2353.

Next, we make the transition to discrete-time signals by considering sampled sinusoidal signals. The basic linear system concepts are then introduced with running average systems and other simple finite-impulse-response (FIR) digital filters. Impulse sequences are presented leading also to the impulse response characterization of a filter. Convolution is treated as a numerical operation using discrete-time signals and systems. The key concept of frequency response is derived and interpreted for FIR filters emphasizing the magnitude and phase changes experienced by sums of sinusoid when filtered by a linear time-invariant system. Next, the concept of discrete-time Fourier transform (DTFT) arises naturally including the inverse DTFT allowing us to define ideal filters. We then move to the discrete Fourier transform (DFT) deriving it as a sampled version of the DTFT and computable through popular fast algorithms that are not discussed in detail. The ideas of DTFT and DFT allows for an understanding of practical spectrum analysis to successfully employ the powerful spectrum analysis tools readily available in software environments such as MATLAB.

Finally, the z-transform is introduced in Chapter 9 and (Infinite Impulse Response) IIR systems in Chapter 10. At this stage, a student will be rewarded with the ability to understand applications involving the sampling theorem, discrete-time filtering, and spectrum analysis. Furthermore, they will be prepared to move on to courses in linear analog circuits, continuous-time signals and systems. In general, this course will also help prepare students for Senior (and graduate) level courses in Controls, Communications and Signal and Image Processing.

Course Policies:

- Usually, homeworks are done by hand. It should be scanned and uploaded to Blackboard in **PDF** file. Please, **DO NOT** submit pictures, word, excel, or powerpoint files. (Use scanner application if you do not have scanner and submit only **ONE** file).

Some problems will be solved in class, solutions or brief answers will be provided before quizzes are given.

- Quizzes (every 1-2 weeks) will be based on the homework problems expecting that each student attempted the problems and used the homework solutions to correct mistakes and improve understanding. The approach will be closed book, solve by hand, with limited time allowed during the class time period.
- Exams rules will be determined for each exam the week prior to its offering. These exams are to be solved by hand with self-prepared, handwritten notes and paper copies of key textbook Tables allowed.
- If there is any suspected copying on quizzes and exams, seating arrangements will be used. In all cases, the uniqueness of the solution process will be evaluated and suspected incidents will be documented for eventual reporting to the University academic dishonesty authorities.
- Late homeworks are not allowed without valid reasons (**written** medical, legal, military, or work justification). Special circumstances will be considered if reported on time.

IMPORTANT

Accommodations and Rules due to COVID-19:

- If the student has Covid symptoms, he/she must stay at home and work at home. Send an email to the instructor notifying the problem.
- Also, If the student tested positive, please notify the instructor and Written Medical Note must be presented via email and reported on time.
- Assignments will be rescheduled later in the Spring semester.

Evaluation and Grading

Each lab exercise will be evaluated in the following manner:

Evaluation	
In-class Semester Exams (2-3 in-class exams, with self-prepared notes)	45%
Homeworks, Matlab Projects, Lab. Assignments	15%
Quizzes	15%
Comprehensive in-person Final Exam (with notes allowed), during Final Exams week	25%

Letter grades will be assigned according to the following scale:

Grading	
A	100-90%
B	89-80%
C	79-70%
D	69-60%
F	59-0%

Topics 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- Sinusoids, Spectrum Representation, Sampling and Aliasing (focus on sums of sinusoids, Chapters 2-4, Appendix C)

- II- Finite Impulse Response (FIR) filter impulse response and convolution (Chapter 5).
- III- FIR filter Frequency Response and its application to filtering of sinusoidal signals (Chapter 6).
- III- Discrete-Time Fourier Transform (DTFT) pairs and properties and its application to analysis and design of FIR filters (Chapter 7).
- IV- Computation of the DTFT using the Discrete Fourier Transform (DFT) (parts of Chapters 8)
- IV- Z-Transform (Chapter 9)
- V- Infinite Impulse Response (IIR) Filters basic introduction (parts of Chapter 10)

Computer Usage

The MATLAB software package (with many Toolkits and 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). <http://etc.utep.edu/> Tel. (915)747-5223, E-mail: etchelpdesk@utep.edu

With luck, there will be an option to simply download Matlab that does not need the VPN from www.utep.edu/matlab.which (it is big, about 6 Gbytes). More on this as we get the official policy from 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 or Visa complications (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 to class if possible.
 - 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.
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- **Fairness statement** : the key fairness criterion for this course is equal opportunity for all students to receive feedback, help, information, scores, handouts, etc., individual requests

cannot be accommodated. Grades are not negotiable individually but fair adjustments can be made for the whole class.

Email Communication

For email communication, please provide the course name – Your name.
(For example, EE2151 – Martha Torres). Send all messages from your Miners account only.

Academic Conduct

Academic dishonesty will not be tolerated. You must submit your work only. If you are found to be cheating or plagiarizing, you will be subject to disciplinary action, per UTEP catalog policy (<http://www.utep.edu/dos/acadint.htm>). See the OSCCR homepage at <http://sa.utep.edu/osccr/> for more information.

Harassment

Please be aware that harassment is unacceptable in the classroom. Jokes, comments of sexual nature, as well as racist comments will not be tolerated. The student that violates this rule will be sent to the Dean of students for disciplinary action.

American Disabilities Act

If you have a disability and need special accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at <http://sa.utep.edu/cass/>

Note

The instructor reserves the right to make any changes to the syllabus during the term of the semester. The instructor will notify any changes made to the syllabus to the students prior to the lecture week.

Students Resources:

Utep Library : Provide access to full text online or presence, journals, conference papers and eBooks. Website: <https://www.utep.edu/library/>

Help Desk and ETC Center: For technological issues, software issues, email or Blackboard accounts, please contact: helpdesk@utep.edu or etchelpdesk@utep.edu

University Writing Center (UWC): Provides assistance for writing style and formatting papers or assignments. Website : <https://www.utep.edu/uwc/>

Math Tutoring Center (MaRCS): Provides tutoring and resource for Math courses. Website: <https://www.utep.edu/science/math/marcs/>