

EE2353 Spring 2022: Syllabus **Version 1, Jan. 18**

CONTINUOUS-TIME SIGNALS AND SYSTEMS (CRN: 21905)

INSTRUCTOR: Sergio D. Cabrera, Associate Professor
Dept. of Electrical and Computer Eng.
Engineering Annex Bldg. Room A306, UTEP campus
Tel. Direct (915)747-6968; ECE Dept. (915)747-5470;
E-mail: sergioc@utep.edu (best way to communicate)

OFFICE HRS.: Monday, Wednesday **EE2353** 11:30 – 12:30 PM also on BlackB
Office in Eng. A306 Friday for **everyone**: 11:00 AM – 12:00PM
(Occasionally, I will send e-mail to cancel or re-schedule)

CLASS TIME/PLACE: **Tuesday and Thursday 12:00 PM – 1:20 PM**
Liberal Arts (LART) 222

TEXTBOOKS, ONLINE TOOLS, ADDITIONAL MATERIALS PROVIDED, ETC.:

I- Signals & Systems: Theory and Applications by Ulaby and Yagle, Michigan Publishing, 2018, 666 pages.

Free download at <https://services.publishing.umich.edu/publications/ee/>

The book has a companion Web site at ss2.eecs.umich.edu

It has additional examples and problems, solutions to selected problems, Labview student edition download instructions for LabView Student Edition, Labview modules, Matlab modules, etc.

This same book is found in hardbound version under a slightly different name: Engineering Signals and Systems in Continuous and Discrete Time, Second Edition. National Technology & Science Press, 2016.

II- OPTIONAL: NI Engineering Signals & Systems (2e) based on above book by Ulaby and Yagle. Interactive book on zybooks.com (can be adopted on a voluntary basis for those wanting “more action” and credit for participation in additional activities) costing approximately \$48 per student per semester. More later and in class.

III- STUDY GUIDE: Old Quizzes and old Exams, etc. will be made available to all students to reduce incentive to look for previous semester or 3rd party materials and to discourage the use of online problem solving Web sites.

Course Catalog Description: Representation and analysis of continuous time signals; time and frequency analysis of linear time-invariant systems; convolution, differential equations, Laplace transform, Fourier series and transform, filters.

Pre-requisites: EE2351 Electric Circuits 2 with a minimum grade of “C”.

Prerequisites by topic: calculus and differential equations; complex numbers and functions; basic time-domain, steady-state and transform domain Circuit Analysis; basic familiarity with MATLAB software tools.

Specific Outcomes for the Course. By the end of the semester the student will demonstrate the ability to:

- Carry out transformations of signals and characteristics of continuous-time (C-T) signals and systems.
- Apply convolution and its properties to solve Linear Time-Invariant (LTI) systems.
- Use Fourier series, Fourier transforms and their properties to analyze C-T signals and systems.
- Compute and use impulse and frequency responses of linear time invariant systems.
- Use the Laplace transform to analyze C-T systems.

IMPORTANT POLICY:

- Homeworks will be graded pass-fail to emphasize attempting the problems and using the solutions later to check your work. Some problems will be solved in class, solutions or brief answers will be provided well before quizzes are given.
- **NEW/Tentative:** Quizzes (**every 1-2 weeks**) will be based (modified) 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 (**tentative**), 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.

COURSE GRADING (somewhat flexible)

• In-class Semester Exams (2-3 in-class exams, with self-prepared notes)	45% (*or 30%)
• Homeworks, Matlab Projects, etc.	15% (*same 15%)
• Quizzes	15% (*same 15%)
• Comprehensive in-person Final Exam during Final Exams week	25% (*or 40%)
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)

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 including Blackboard announcements announcing availability of documents for download, etc..

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). <http://etc.utep.edu/> Tel. (915)747-5223, E-mail: etchelpdesk@utep.edu
Most likely, you can download Matlab and use it without a VPN connection, try this www.utep.edu/matlab.which (it is big, about 6 Gbytes).

TOPICS TO BE COVERED BASED ON U-Y TEXTBOOK (the exact order, pages and/or sections and subsections will be listed in homework assignment handouts). Description of topics are slightly modified from the table of contents. A few ***supplementary topics will be added in the Lecture Slides***. To minimize overlap with EE2351, let's cut as much as possible from familiar circuits examples and problems. The list of topics illustrating this idea is the following:

U-Y Chapter 1 Signals:

1-1 Types of Signals, define Systems; 1-2 Signal Transformations; 1-3 Waveform/Signal Properties; 1-4 Basic Waveforms: steps, ramps, rectangles, impulses, exponentials, etc.; 1-5 Signal Power and Energy;

U-Y Chapter 2 Linear Time-Invariant Systems

2-1 Linear Time-Invariant (LTI) Systems; 2-2 Impulse Response and Step Response; 2-3 Convolution derivation; 2-4 Graphical Convolution evaluation (***with important supplementary examples using integrations***); 2-5 Properties of the Convolution operation; 2-6 Causality and BIBO Stability of LTIs; 2-7 LTI Sinusoidal Response; **EE Examples:** Circuits, communications, averaging filters, etc.

U-Y Chapter 3 Unilateral Laplace Transform Review and Extensions

3-1 Definition of the (Unilateral) Laplace Transform; 3-2 Poles and Zeros; 3-3 Properties of the Laplace Transform; ~~3-4 Circuit Analysis Example~~; 3-5 Partial Fraction Expansion; 3-6 Transfer Function $H(s)$; 3-7 Poles and System Stability; 3-8 Invertible Systems; 3-9 Bilateral Transform for Continuous-Time Sinusoidal Signals (time permitting).

U-Y Chapter 4 Applications of the Laplace Transform

4-6 Configurations of Multiple Systems; 4-7 System Synthesis; 4-8 Basic Control Theory; 4-11 Step Response of a Motor System; 4-12 Control of a Simple Inverted Pendulum on a Cart (time permitting).

U-Y Chapter 5 Fourier Analysis Techniques

5-3 Fourier Series Representations; 5-4 Computation of Fourier Series Coefficients; 5-5 Circuit Analysis with Fourier Series; 5-6 Parseval's Theorem for Periodic Waveforms; 5-7 Fourier Transform; 5-8 Fourier Transform Properties; 5-9 Parseval's Theorem for Fourier Transforms; 5-10 Additional Attributes of the Fourier Transform; 5-11 Phasor vs. Laplace vs. Fourier; ~~5-12 Circuit Analysis with Fourier Transform (time permitting).~~

U-Y Chapter 6 Applications of the Fourier Transform

6-2 Types of Filters; 6-5 Ideal Brick-Wall Filters; 6-6 Filter Design by Poles and Zeros; 6-7 Frequency Rejection Filters; 6-8 Spectra of Musical Notes; 6-9 Butterworth Filters; 6-10 Denoising a Trumpet Signal; 6-11 Resonator Filter; 6-12 Modulation; 6-13 Sampling Theorem.

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.

ACADEMIC INTEGRITY: Please review the statements below and UTEP's Web page on Policy on Academic Integrity at: <https://www.utep.edu/student-affairs/osccr/student-conduct/academic-integrity.html>