University of Texas at El Paso
Electrical and Computer Engineering
Continuous Time Signals and Systems
Fall 2020 – Section 003
EE2353-18566

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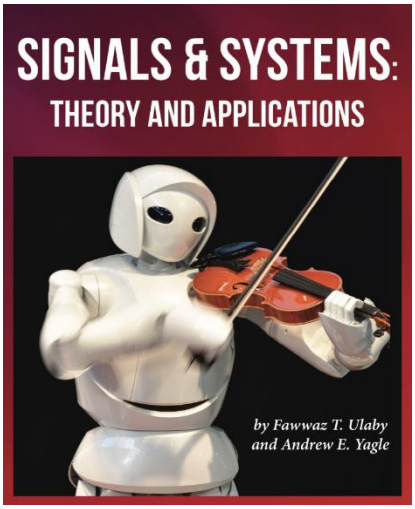
Lecture HOURS:	MW 9:00AM – 10:20 AM, via Blackboard Collaborate
OFFICE HOURS:	M 1:00 – 2:00 PM, via MS Teams W 4:00 – 5:00 PM, via MS Teams
TEXT: (Also recommended references)	• Signals & Systems: Theory and Applications by Ulaby and Yagle, Michigan Publishing, 2018, 666 pages. • Free download at https://services.publishing.umich.edu/publications/ee/ • Zybook Optional Interactive version ($58) , with animations and exercises. 1. Sign in or create an account at learn.zybooks.com 2. Enter zyBook code: UTEPEE2353GonzalezFall2020 3. Subscribe  •  • Continuous_Time_Signals_and_Systems (Edition 2.0) by Michael D. Adams - 366 pages • Free download from: https://books.google.com/books/about/Continuous_Time_Signals_and_Systems_Edit.html?id=BWPXDwAAQBAJ

	• Or here: https://www.ece.uvic.ca/~frodo/sigsysbook/downloads/continuous_time_signals_and_systems-2013-09-11-uvic-v2.pdf • Supplemental materials in Blackboard
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
Prerequisites/ Co-requisites	Prerequisites: EE2351, MATH2326 Calculus and differential equations; complex numbers and functions; basic time-domain, steady-state and transform domain Circuit Analysis; basic familiarity with MATLAB software tools
Software	MATLAB, LabVIEW, available for download through the ETC office, to get your own free license. https://www.utep.edu/engineering/etc/Software/ Limited access through my.apps.utep.edu https://my.apps.utep.edu/vpn/index.html

Course Outcomes

1. Apply circuit analysis techniques to analyze first and second order circuits in the time domain.
2. Understand the concepts or natural and forced response, zero-input, zero-initial conditions in the analysis of electric circuits.
3. Apply Laplace transform techniques to represent circuits in the frequency domain, analyze using systematic methods (node, mesh, terminal equivalency, and circuit theorems), and derive input-output representations such as transfer functions.
4. Understand the concept of resonance and apply circuit analysis techniques to series and parallel RLC circuits.
5. Apply Fourier series to analyze circuits fed by non-sinusoidal periodic sources in steady state.
6. Understand and determine using circuit analysis techniques representations of two-port circuits.
7. Apply software tools to the analysis of electric circuits in the frequency and time domain.

Tentative Calendar

Session#	Week	Topic	Chapter
1	08/24/20	Signals and systems	1U
2	08/31/20	Continuous Time systems *(MATLAB Tutorials)	Ch 2 Ad
3	09/07/20	Linear Time invariant (LTI) systems *(LabVIEW tutorials)	2-(1-4) U
4	09/14/20	Convolution and LTI response *(EXAM)	2-(5-7) U
5	09/21/20	Laplace Transform Review *(Project 1)	3-(1-4) U

6	09/28/20	Laplace Transform Properties	3-(5-7,9) U
7	10/05/20	Laplace Transform Applications *(Project 2)	4-(8, 9, 11, 12) U
8	10/12/20	Fourier Series *(EXAM)	5-(1-4) U
9	10/19/20	Fourier Series properties *(Project 3)	5-(5-6) U
10	10/26/20	Fourier Transform	5-(7-9) U
11	11/02/20	Fourier Transform Attributes	5-(10-13) U
12	11/09/20	Fourier Applications *(Project 4)	6-(1-5) U
13	11/16/20	Filters *(EXAM)	6-(6-13) U
14	11/23/20	supplemental from Adams *(Project 5)	Ch 6 Ad
15	11/30/20	TBD	
16	12/07/20	Final Exams or Project	

Content Material

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.

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;

Supplement from Adams Chapter 2: Continuous-Time Systems; Block Diagram Representation; Interconnection of Systems; Properties of Continuous-Time Systems Properties: Memory; Causality; Invertibility; Stability; Time Invariance; Linearity Examples.

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;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. ~~2-8 Impulse Response of Second-Order LCCDEs; 2-9 Example LTI: Car Suspension System~~

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;~~3-10 Interrelating Different Descriptions of LTI Systems;~~~~3-11 LTI System Response Partitions;~~

U-Y Chapter 4 Applications of the Laplace Transform
~~4-1 **s**-Domain Circuit Element Models;4-2 **s**-Domain Circuit Analysis;4-3 Electromechanical Analogs;4-4 Biomechanical Model of a Person Sitting in a Moving Chair;4-5 Op-Amp Circuits;4-6 Configurations of Multiple Systems;4-7 System Synthesis;~~4-8 Basic Control Theory;4-9 Temperature Control System;~~4-10~~

~~Amplifier Gain-Bandwidth Product~~;4-11 Step Response of a Motor System;4-12 Control of a Simple Inverted Pendulum on a Cart.

U-Y Chapter 5 Fourier AnalysisTechniques
5-1 Phasor-Domain Technique; 5-2 Fourier Series Analysis Technique;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; 5-13 The Importance of Phase Information;

U-Y Chapter 6 Applications of the Fourier Transform
6-1 Filtering a 2-D Image; 6-2 Types of Filters; 6-3 Passive Filters; 6-4 Active 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.

Supplement from Adams Chapter 6: ~~Bilateral Laplace Transform: Introduction; Motivation Behind the Laplace Transform; Definition of the Laplace Transform;~~ Relationship Between Laplace Transform and Continuous-Time Fourier Transform; Laplace Transform Examples; Region of Convergence for the Laplace Transform; Properties of the Laplace Transform; ~~Linearity Time-Domain Shifting; Laplace-Domain Shifting; Time-Domain/Laplace-Domain Scaling; Conjugation;~~ Time-Domain Convolution; ~~Time-Domain Differentiation; Laplace-Domain Differentiation;Time-Domain Integration; Initial Value Theorem Final Value Theorem;~~ More Laplace Transform Examples; Determination of the Inverse Laplace Transform; Characterizing LTI Systems Using the Laplace Transform System Function and System Properties; Causality; Stability; Invertibility; Systems and Differential Equations; Interconnection of LTI Systems; ~~Unilateral Laplace Transform; Solving Differential Equations Using the Unilateral Laplace Transform.~~

General Policies

- Each session consists on learning modules available through BlackBoard. They are composed of brief notes, videos and assigned readings.
- You are expected to dedicate about 2 to 3 hours per session to review the assigned materials, answer problems, submit postings and assignments.
- Exam will become available Fridays and will be due on Mondays. There are 4 exams.
- Students are highly encouraged to participate in the allocated office hours to interact with the instructor. This will be done through Blackboard Collaborate in an open discussion room to clarify questions or have further explanations about the course subjects. Recordings will be made and be available for later review.
- For the final sessions, the students will need to form teams and will be assigned a current topic in the industry. The team will need to make a slide presentation / video presentation (guidelines available in Blackboard) and upload to instructor to share with class.
- The EE2151 is a corequisite to the course. However, the topics and the grading are separate.
- Technology Requirements

- Course content is delivered via the Internet through the **Blackboard** learning management system (LMS). Ensure your UTEP e-mail account is working and that you have access to the Web and a stable web browser. Mozilla Firefox and Google Chrome are the most supported browsers for Blackboard; other browsers may cause complications with the LMS. When having technical difficulties, update your browser, clear your cache, or try switching to another browser.
- You will need to have or have access to a computer/laptop, scanner, a webcam, and a microphone. You will need to download or update the following software: Microsoft Office, PDF reader tool (Adobe or others), Media players (Flashplayer, Windows Media Player or QuickTime), and Java. Check that your computer hardware and software are up-to-date and able to access all parts of the course.
- You will need to use LabView and Matlab to solve some assignments and Projects.
- If you encounter technical difficulties beyond your scope of troubleshooting, please contact the Help Desk as they are trained specifically in assisting with technological needs of students.

GRADING

ITEM	Points / Total
Exams 1, 2, & 3	150 ea / 450 total
Weekly Assignments posted to discussion boards (10)	15ea / 150 total
MATLAB and LabView Tutorials	50 ea / 100 total
Projects (5)	40ea / 200 total
Final Exam or Project	150 total
TOTAL	1000+50

- Each element will accumulate points, Some elements are individual and others depend on team performance (presentations)
- Exams will be conducted through Blackboard and require solving problems or applying concepts.
- **Show always all the procedure** to arrive to the solutions. End results without the right procedure are considered conceptual errors. Procedures for exams will be uploaded separately.
- After the initial grading is done, to earn partial credit, students might need to identify the cause of the errors and provide with an additional correction document stating the proper procedure to obtain a valid answer. (maximum 50 % credit only)
- **Homework** Students will need to propose a solution to an open-ended problem and posting the concise proposal in the Blackboard discussion boards within 24 hours of finishing the corresponding content session. Expected length is between one or two paragraphs per problem and attach needed graphics.
    - Afterwards, students are required to inspect at least two proposals from other students and make comments about the solutions. Responses must be posted no later than 48 hrs after the assignment become active. The length of the comments should be about one single paragraph.
- Letter scale will be **A:** 90%-100%; **B:** 80%-89.9%; **C:** 70%-79.9%; **D:** 60%-69.9%; **F:** below 60% of the reference grade.
- Team assignment require forming a team consisting of **3 UG students**.

- All members ***must contribute*** for each assignment and shall be able to demonstrate it, along with the understanding of their peer's portions.
- **Each report must have a typed cover page**.
- Reports will be turned in to the professor or the TA before each deadline through the assignment area in **Blackboard**.
- Some large attachments might require saving the document in a shared OneDrive folder and share the link with the instructor.
- Additional requirements may be stated in specific assignments.

GENERAL COURSE POLICIES

- Samples of student work will be collected for accreditation purposes. Please notify the professor, in writing, if there is any confidentiality restriction.
- **No late work** will be accepted and special accommodations require the letters with instructions from CASS.
- The Professor will be available only during the assigned office hours or by appointment.
- For email questions or concerns, please start the email subject line with " **EE2351: …** " .
- Each piece of written work must include **EE2351**, **name,** student **ID, TEAM** number (when applicable) at the **upper right corner** of the first page; and the **name** in all remaining pages.
- All printed work must have good presentation. Final results must be emphasized (example red underline or highlighted box)
- Online work must have in the first text line the name of the student and the team number when applicable.
- Detailed instructions for the **assignments** will be **provided later** in separate handouts through **Blackboard**

Academic Honesty, Accommodations and NETiquette

- It is expected that the students will conduct with integrity in all course areas. Do not attempt to engage in a dishonest activity such as copying, plagiarism, falsifying information, etc. The professor will take measures to prevent such instances and will bring a case to the university authorities.
- Information about University wide policies could be found in the Dean of Students Web page at http://studentaffairs.utep.edu/Default.aspx?alias=studentaffairs.utep.edu/dos
- NETtiquette
    - Always consider audience. Remember that members of the class and the instructor will be reading any postings.
    - Respect and courtesy must be provided to classmates and to instructor at all times. No harassment or inappropriate postings will be tolerated.
    - When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a F2F situation.
    - Blackboard is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space. If students wish to do so, they have the ethical obligation to first request the permission of the writer(s).

- The University is committed to providing reasonable accommodations and auxiliary services to students, staff, faculty, job applicants, applicants for admissions, and other beneficiaries of University programs, services and activities with documented disabilities in order to provide them with equal opportunities to participate in programs, services, and activities in compliance with sections 503 and 504 of the Rehabilitation Act of 1973, as amended, and the Americans with Disabilities Act (ADA) of 1990 and the Americans with Disabilities Act Amendments Act (ADAAA) of 2008. Reasonable accommodations will be made unless it is determined that doing so would cause undue hardship on the University. Students requesting an accommodation based on a disability must register with the UTEP Center for Accommodations and Support Services.

STUDENT RESOURCES

UTEP provides a variety of student services and support:

- UTEP Library: Access a wide range of resources including online, full-text access to thousands of journals and eBooks plus reference service and librarian assistance for enrolled students.
- Help Desk: Students experiencing technological challenges (email, Blackboard, software, etc.) can submit a ticket to the UTEP Helpdesk for assistance. Contact the Helpdesk via phone, email, chat, website, or in person if on campus.
- University Writing Center (UWC): Submit papers here for assistance with writing style and formatting, ask a tutor for help and explore other writing resources.
- Math Tutoring Center (MaRCS): Ask a tutor for help and explore other available math resources.
- History Tutoring Center (HTC): Receive assistance with writing history papers, get help from a tutor and explore other history resources.
- Military Student Success Center: UTEP welcomes military-affiliated students to its degree programs, and the Military Student Success Center and its dedicated staff (many of whom are veterans and students themselves) are here to help personnel in any branch of service to reach their educational goals.
- RefWorks: A bibliographic citation tool; check out the RefWorks tutorial and Fact Sheet and Quick-Start Guide.