ELEN310 16

Course Summary

Course : ELEN310 **Title :** Continuous and Discrete Signals and Systems
Length of Course : 16
Prerequisites : MATH210, ELEN305 **Credit Hours :** 4

Description

Course Description: This course is presents signal and system description and characterization in the time and frequency domains for linear time-invariant (LTIV) systems. Time domain topics include differential and difference equations; convolution; and Fourier Series. Frequency domain material will incorporate Fourier transforms; Laplace transforms; z-transforms; and system description via transfer functions. The sampling theorem will be addressed. State-space representation of LTIV systems in either the time or frequency domains will be introduced. The course will show students how to characterize and analyze systems in either time or frequency and transform between domains. Students will be shown how to determine and apply a correct technique to either analyze an existing system or design a system to meet specifications. NOTE: This course requires the student to purchase additional materials that are not covered by the book grant. Please refer to the Course Materials section for additional details. (Prerequisites: ELEN305 and MATH210)

Course Scope:

This course is delivered online and covers the description and analysis of signals and systems in the time and frequency. Different methods of design and analysis are included; the student will know which method to use for best results. Students will have an understanding of both continuous and discrete linear time invariant (LTIV) systems. Students are given opportunities to apply the theory to the design and analysis of LTIV systems using examples presented in the text and labs.

Objectives

After completing the course, the student should be able to accomplish these Course Objectives (CO):

CO-1 Perform analysis and calculations related to discrete and continuous time linear systems

CO-2 Apply the correct analysis technique for a given system classification and transfer function response

CO-3 Analyze analog and discrete signals and systems using computer-aided design and analysis tools such as MatLab

CO-4 Analyze a signal using Fourier series and Fourier transforms

CO-5 Analyze a signal using Laplace transforms and a transfer function representation

CO-6 Describe the types of system models

Outline

Week 1: Signals and Waveforms

Learning Objective(s)

- Types of Signals
- Transformations
- Waveform Properties
- Nonperiodic waveforms
- Signal Power and Energy

(CO-1), (CO-6)

Readings

Chapter 1

Assignment(s)

Introduction

Assignment #1

Forum #1 Participation

Week 2: Linear Time- Invariant Systems

Learning Objective(s)

- LTIV Systems
- Impulse Response
- Convolution
- Causality and BIBO Stability
- Sinusoidal Responses
- Impulse Response of Second-Order Systems

(CO-1)

Readings

Chapter 2

Assignment(s)

Assignment #2

Forum #2 Participation

Lab #1

Week 3: Linear Time-Invariant Systems continued

Learning Objective(s)

- LTIV Systems
- Impulse Response
- Convolution
- Causality and BIBO Stability
- Sinusoidal Responses
- Impulse Response of Second-Order Systems

(CO-1)

Readings

Chapter 2

Assignment(s)

Assignment #2

Forum #2 Participation

Week 4: Laplace Transform

Learning Objective(s)

- Definition
- Poles and Zeros
- Properties of the Laplace transform
- Circuit Analysis using Laplace transforms
- Partial fraction expansion
- Transfer function H(s)
- System Stability
- Invertible Systems
- LTIV System Response

(CO-2), (CO-5)

Readings

Chapter 3

Assignment(s)

Assignment #3

Forum #3 Participation

Lab #2

Week 5: Laplace Transform continued

Learning Objective(s)

- Definition
- Poles and Zeros

- Properties of the Laplace transform
- Circuit Analysis using Laplace transforms
- Partial fraction expansion
- Transfer function H(s)
- System Stability
- Invertible Systems
- LTIV System Response

(CO-2), (CO-5)

Readings

Chapter 3

Assignment(s)

Assignment #3

Forum #3 Participation

Lab #2 continued

Week 6: Applications of the Laplace Transform

Learning Objective(s)

- S-domain circuit models
- S-domain circuit analysis
- Electromechanical analogs
- Op-amp circuits
- System synthesis
- Basic control theory

(CO-2), (CO-5)

Readings

Chapter 4

Assignment(s)

Assignment #4

Forum #4 Participation

Week 7: Exam Review and Catch-up, Exam 1

Learning Objective(s)

None

Readings

None

Assignment(s)

Exam #1

Week 8: Review Exam, Fourier Analysis Techniques

Learning Objective(s)

- Phasor-domain techniques
- Fourier Series
- Circuit analysis with Fourier Series
- Parseval's theorem
- Fourier transform
- Which transform to use?
- Circuit analysis with Fourier transforms

(CO-1), (CO-4)

Readings

Chapter 5

Assignment(s)

Assignment #5

Forum #5 Participation

Week 9: Applications of the Fourier transform

Learning Objective(s)

- Filters and filter design
- Amplitude modulation
- Sampling theorem

(CO-3), (CO-4)

Readings

Chapter 6

Assignment(s)

Assignment #6

Forum #6 Participation

Lab #3

Week 10: Applications of the Fourier transform continued

Learning Objective(s)

- Filters and filter design
- Amplitude modulation
- Sampling theorem

(CO-3), (CO-4)

Readings

Chapter 6

Assignment(s)

Assignment #6

Forum #6 Participation

Lab #3 continued

Week 11: Exam Review and Catch-up, Exam 2

Learning Objective(s)

None

Readings

None

Assignment(s)

Exam 2

Week 12: Exam Review, Discrete time signals and systems

Learning Objective(s)

- Discrete-time signals
- Discrete-time systems
- Discrete-time convolution

- Z-transforms
- Inverse z-transforms
- Solutions of difference equations
- System transfer functions
- System frequency responses
- Discrete-time Fourier Series
- Discrete-time Fourier transforms
- Fast Fourier transforms

(CO-1), (CO-2), (CO-3)

Readings

Chapter 7

Assignment(s)

Assignment #7

Forum #7 Participation

Lab #4

Week 13: Discrete time signals and systems continued

Learning Objective(s)

- Discrete-time signals
- Discrete-time systems
- Discrete-time convolution

- Z-transforms
- Inverse z-transforms
- Solutions of difference equations
- System transfer functions
- System frequency responses
- Discrete-time Fourier Series
- Discrete-time Fourier transforms
- Fast Fourier transforms

(CO-1), (CO-2), (CO-3)

Readings

Chapter 7

Assignment(s)

Assignment #7

Forum #7 Participation

Lab #4 continued

Week 14: Applications of Discrete-time signals and systems

Learning Objective(s)

- Discrete-time filters
- Deconvolution
- Deconvolution and filtering using the DFT
- Spectra of periodic signals
- Spectra of nonperiodic signals

(CO-1), (CO-2), (CO-3)

Readings

Chapter 8

Assignment(s)

Assignment #8

Forum #8 Participation

Lab #5

Week 15: Applications of Discrete-time signals and systems continued

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Learning Objective(s)

- Discrete-time filters

- Deconvolution
- Deconvolution and filtering using the DFT
- Spectra of periodic signals
- Spectra of nonperiodic signals

(CO-1), (CO-2), (CO-3)

Readings

Chapter 8

Assignment(s)

Assignment #8

Forum #8 Participation

Lab #5 continued

Week 16: Exam Review and Catch-up, Exam 3

Learning Objective(s)

None

Readings

None

Assignment(s)

Forum #9 Participation

Exam 3

Evaluation

Instructor announcements: Weekly announcements will be made on Monday of each week in the online classroom. These announcements will also be e-mailed to each student. The announcements will discuss the assignments for the week along with any other pertinent information for the week.

This is an upper level course; all students' work is to be presented as such in terms of quality and content. The grading system will be based on your participation in the forums (100 points or 12.5% of your total grade); homework assignments (200 points or 25% of your grade); labs (200 points or 25% of your grade); and three exams (300 points or 37.5% of your grade).

Reading Assignments: Please refer to the Course Outline section of this syllabus for the weekly reading assignments.

Week 1 Introductions: Students must log into the classroom and post an introduction to the class during the first week of class. Your response is due by Sunday of Week 1. The Week 1 introduction must be greater than 250 words (a requirement) and include the following information.

a. Your name
b. Your university major or program
c. Where you are in the program of study
d. Your academic goals, to include why you are taking this class

e. Information that you would like to share about yourself

Weekly Forums: The weekly discussion forum is for students to post their questions on course content for that week. This forum should not be used to discuss specific graded material questions prior to receiving feedback from the instructor. If there is a question on a specific graded question, find a similar problem in the book and ask a question on that problem or concept. Asking specific questions on graded questions creates an unfair advantage and defeats the purpose of the assessment tool. Specific topics will occur throughout the course and will require critical thought/research for your input – be sure to keep up with ongoing discussions! Assigned forum posts will count 12.5% of the course grade.

Assignments: There will be eight assignments during the course worth a total of 25% of your total grade. Each assignment will cover one chapter of the book. For problems requiring mathematical calculations, show your work.

Exams: There will be three exams worth a total of 37.5% of the final grade. They will be open book, open note exams and will be administered without a proctor. Students must complete numbered exams by the end of the week indicated in the syllabus and in the classroom.

Labs: There will be four labs assigned throughout the course. Labs will count for a total of 25% of your grade.

Grading:

Name	Grade %
Forums	12.50 %
Introduction	1.25 %
Forum 1	1.25 %
Forum 2	1.25 %
Forum 3	1.25 %
Forum 4	1.25 %
Forum 5	1.25 %
Forum 6	1.25 %
Forum 7	1.25 %
Forum 8	1.25 %
Final Reflections	1.25 %
Assignments	25.00 %
Assignment 1: Signals and Waveforms	3.13 %
Assignment 2: Linear Time Invariant Systems	3.13 %
Assignment 3: Laplace Transforms	3.13 %
Assignment 4: Application of Laplace Transforms	3.13 %
Assignment 5: Fourier Analysis Techniques	3.13 %
Assignment 6: Applications of Fourier Transforms	3.13 %
Assignment 7: Discrete-time Signals and Systems	3.13 %
Assignment 8: Applications of Discrete-time Signals and Systems	3.13 %
Labs	25.00 %
Lab #1	5.00 %
Lab #2	5.00 %
Lab #3	5.00 %
Lab #4	5.00 %

Lab #5	5.00 %
Exams	37.50 %
Exam I	12.50 %
Exam II	12.50 %
Exam III	12.50 %

Materials

Book Title: Engineering Signals and Systems

Author: Ulaby, Yagle

Publication Info: NTS Press

ISBN: 783354-01

Book Title: MATLAB and Simulink Student Suite-Not covered by the APUS Grant - available to purchase at https://www.mathworks.com/store/link/products/student/SV?s_tid=ac_buy_sv_but1_2

Author:

Publication Info:

ISBN: NTMO

Book Title: NI Student Software Suite - access instructions provided inside the classroom

Author: National Instruments

Publication Info: National Instruments

ISBN: 779252-3501

Book Title: myParts Kit from Texas Instruments - this item is not covered by the APUS Book Grant; instructions on how to purchase are available here: https://apus.libanswers.com/coursematerials/faq/239701

Author: National Instruments

Publication Info: National Instruments

ISBN: 783752-01

Book Title: NI Elvis Kit - this item is not covered by the APUS Book Grant; instructions on how to purchase are available here: https://apus.libanswers.com/coursematerials/faq/239701

Author: National Instruments

Publication Info: National Instruments

ISBN: 780381-02

Book Title: NI myRIO Starter Accessory Kit - this item is not covered by the APUS Book Grant; instructions on how to purchase are available here: https://apus.libanswers.com/coursematerials/faq/239701

Author: National Instruments

Publication Info: National Instruments

ISBN: 783068-01

Book Title: Engineering Signals & Systems: Hands-on Labs with ELVIS - free download available here:

http://www.ni.com/white-paper/52055/en/

Author: Doering, Ed

Publication Info: National Instruments

ISBN: 783083-01

Book Title: Until further notice, required hard copy books and kits will ship without any action needed from students. Your shipping address on file must be current - https://apus.libanswers.com/coursematerials/faq/238652

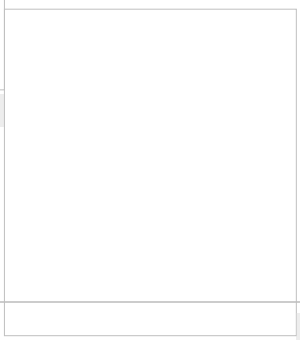
Author:

Publication Info:

ISBN: HC NOTE

Textbook cover picture

Signals & Systems: Theory and Applications by Ulaby and Yagle
Michigan Publishing, 2018, 666 pages.
Click here for a pdf copy of the textbook.



Click here for a pdf copy of the lab manual:
ENGINEERING SIGNALS & SYSTEMS:
HANDS-ON LABS with NI ELVIS by Ed Doering

Course Guidelines

Citation and Reference Style

- Attention Please: Students will follow the APA Format as the sole citation and reference style used in written work submitted as part of coursework to the University. Assignments completed in a narrative essay or composition format must follow the citation style cited in the APA Format.

Tutoring

- Tutor.com offers online homework help and learning resources by connecting students to certified tutors for one-on-one help. AMU and APU students are eligible for 10 free hours* of tutoring provided by APUS. Tutors are available 24/7 unless otherwise noted. Tutor.com also has a SkillCenter Resource Library offering educational resources, worksheets, videos, websites and career help. Accessing these resources does not count against tutoring hours and is also available 24/7. Please visit the APUS Library and search for 'Tutor' to create an account.

Late Assignments

- Students are expected to submit classroom assignments by the posted due date and to complete the course according to the published class schedule. The due date for each assignment is listed under each Assignment.
- Generally speaking, late work may result in a deduction up to 15% of the grade for each day late, not to exceed 5 days.

- As a working adult I know your time is limited and often out of your control. Faculty may be more flexible if they know ahead of time of any potential late assignments.

Turn It In

- Faculty may require assignments be submitted to Turnitin.com. Turnitin.com will analyze a paper and report instances of potential plagiarism for the student to edit before submitting it for a grade. In some cases professors may require students to use Turnitin.com. This is automatically processed through the Assignments area of the course.

Academic Dishonesty

- Academic Dishonesty incorporates more than plagiarism, which is using the work of others without citation. Academic dishonesty includes any use of content purchased or retrieved from web services such as CourseHero.com. Additionally, allowing your work to be placed on such web services is academic dishonesty, as it is enabling the dishonesty of others. The copy and pasting of content from any web page, without citation as a direct quote, is academic dishonesty. When in doubt, do not copy/paste, and always cite.

Submission Guidelines

- Some assignments may have very specific requirements for formatting (such as font, margins, etc) and submission file type (such as .docx, .pdf, etc) See the assignment instructions for details. In general, standard file types such as those associated with Microsoft Office are preferred, unless otherwise specified.

Disclaimer Statement

- Course content may vary from the outline to meet the needs of this particular group.

Communicating on the Forum

- Forums are the heart of the interaction in this course. The more engaged and lively the exchanges, the more interesting and fun the course will be. Only substantive comments will receive credit. Although there is a final posting time after which the instructor will grade comments, it is not sufficient to wait until the last day to contribute your comments/questions on the forum. The purpose of the forums is to actively participate in an on-going discussion about the assigned content.
- “Substantive” means comments that contribute something new and hopefully important to the discussion. Thus a message that simply says “I agree” is not substantive. A substantive comment contributes a new idea or perspective, a good follow-up question to a point made, offers a response to a question, provides an example or illustration of a key point, points out an inconsistency in an argument, etc.
- As a class, if we run into conflicting view points, we must respect each individual's own opinion. Hateful and hurtful comments towards other individuals, students, groups, peoples, and/or societies will not be tolerated.

Identity Verification & Live Proctoring

- Faculty may require students to provide proof of identity when submitting assignments or completing assessments in this course. Verification may be in the form of a photograph and/or video of the student’s face together with a valid photo ID, depending on the assignment format.
- Faculty may require live proctoring when completing assessments in this course. Proctoring may include identity verification and continuous monitoring of the student by webcam and microphone during testing.

University Policies

Student Handbook

- Drop/Withdrawal policy
- Extension Requests
- Academic Probation
- Appeals
- Disability Accommodations

The mission of American Public University System is to provide high quality higher education with emphasis on educating the nation's military and public service communities by offering respected, relevant, accessible, affordable, and student-focused online programs that prepare students for service and leadership in a diverse, global society.