ECE311: Linear Systems Analysis I, Fall 2023

Time and Location:

TR 12:30 PM -- 1:45 PM, STAD 1204

Instructor:

Ali Pezeshki

Contact Information: <Ali.Pezeshki@colostate.edu>, Tel. 970-491-3242, Engr. C103F

Pezeshki's Office Hours:

Tuesdays 2:30 PM -- 3:30 PM; Engr. C103F

Thursdays 11:00 AM -- 12:00 PM; Engr. C103F

Teaching Assistant

Sydney Harris <sydney.harris@colostate.edu>

Office Hours: MW 11:00 AM -- 12:30 PM; BC In-fill

Textbook:

A. V. Oppenheim, A. S. Wilsky, and S. H. Nawab, Signals and Systems, 2nd Edition, Prentice Hall, 1996.

Additional Reference (not required):

S. Haykin and B. D. Van Veen, Signals and Systems, 2nd Edition, Wiley, 2002.

Exam Calendar:

- Assessment 1 (Exam 1): Sep. 28, 2023; Covers LSM1, LSM2, and KI1
- Assessment 2 (Exam 2): Nov. 9, 2023; Covers LSM3 and KI2
- Assessment 3 (Exam 3): Dec. 13, 2023, 6:20 pm - 8:20 pm; Comprehensive: Covers all LSMs and KIs.

Grading:

- Homework: 18%
- Knowledge Integration (KI): 8%
- Assessment 1 (Exam 1): 22%
- Assessment 2 (Exam 2): 22%
- Assessment 3 (Exam 3): 30%
- Math Foundation: 2% (Extra Credit)

Note 1: Regular attendance in class is required.

Note 2: Late homework submissions will not receive credit.

Note 3: Please see the KI Canvas course for details about the components of KI grades.

Note 4: Math foundation extra credit consists of two components: attending lectures and solving problems sets.

- 1% extra credit for any student who attends at least seven math foundation lectures,
- 1% extra credit for any student who receives an average grade of 85% or more on math foundation problem sets.

Course Topics

LSM1. Transient and Complex Exponential Signals (Chapter 1)

- Continuous-time and discrete-time Signals (1.1)
- Signal energy and power (1.1)
- Periodic signals (1.2)
- Even and odd signals (1.2)
- Continuous-time complex exponential and sinusoidal signals (1.3)
- Discrete-time complex exponential and sinusoidal signals (1.3)
- Discrete-time unit impulse and unit step sequences (1.4)
- Continuous-time unit impulse and unit step functions (1.4)

LSM2. Linear Time-Invariant Systems (Chapters 1 and 2)

- *Continuous-time and discrete-time systems (1.4)*
- *Linearity (1.6)*
- *Time-invariance (1.6)*
- *Discrete-time LTI systems: Convolution sum (2.1)*
- *Continuous-time LTI systems: Convolution integral (2.2)*
- *Properties of LTI systems: Memory, causality, invertibility, stability, and unit step response (2.3)*
- *Causal LTI systems described by differential and difference equations (2.4)*

LSM3. Spectrum Analysis of Continuous-Time Signals (Chapters 3 and 4)

- *Continuous-time Fourier series (3.3)*
- *Convergence of the Fourier series and Gibbs phenomenon (3.4)*
- *Properties of continuous-time Fourier series: Linearity, time shifting, frequency Shifting, differencing, symmetries, multiplication-convolution, and Parseval's identity (3.5)*
- *Continuous-time Fourier transform of aperiodic signals (4.1)*
- *Continuous-time Fourier transform of periodic signals (4.2)*
- *Properties of continuous-time Fourier transform: Linearity, time and frequency shifting, differentiation, symmetries, multiplication-convolution, and Parseval's identity (4.3)*

LSM4. Spectrum Analysis of Discrete-Time Signals (Chapters 3 and 5)

- *Discrete-time Fourier series (3.6)*

- *Properties of discrete-time Fourier series: Linearity, time and frequency shifting, differencing, symmetries, multiplication-convolution, and Parseval's identity (3.7)*
- *Discrete-time Fourier transform of aperiodic signals (5.1)*
- *Discrete-time Fourier transform of periodic signals (5.2)*
- *Properties of discrete-time Fourier transform: Linearity, time and frequency Shifting, differentiation, symmetries, multiplication-convolution, and Parseval's identity (5.3)*
- *Duality between Fourier transform and Fourier series (5.7)*

LSM5. Frequency Response of LTI systems and Sampling (Chapters 6 and 7)

- *Sinusoids and complex exponentials as eigenfunctions of LTI systems (notes)*
- *Frequency response of LTI systems: Magnitude and phase responses (6.1 and 6.2)*
- *Linear phase systems, group delays, and Bode plots (6.2)*
- *Ideal Lowpass, bandpass, and highpass filters (6.3)*
- *First-order and second-order systems (6.5 and 6.6)*
- *Shannon-Nyquist sampling theorem (7.1)*
- *Aliasing effect and antialiasing filters (7.3)*
- *Discrete-time processing of continuous-time signals (7.4)*

Use of Online Homework Helper Sites:

Online "homework helper" sites including, but not limited to Chegg, NoteHall, Quizlet, and Course Hero, Koofers, are meant as study resources to help students better understand basic concepts covered in their courses. They are not intended to do homework/exams from this course for you. The use of such online resources is not permitted for solving homework and exam problems in this course. Your homework and exam submissions must be your independent work. In addition, you are not allowed to post or share homework problems and or exams (in full or in part) from this course to such websites.
