



**ECE311: Linear Systems Analysis I, Fall 2024**

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**Time and Location:**

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

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**Instructor:**

Ali Pezeshki

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

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**Pezeshki's Office Hours:**

Tuesdays 2:00 PM -- 3:00 PM; Engr. C103F

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

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**Teaching Assistant**

 Milton Kundu <Milton.Kundu@colostate.edu>

Office Hours: MW 1:00 PM - 2:30 PM; BC In-fill

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**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.

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**Exam Calendar:**

- Assessment 1 (Exam 1): Sep. 26, 2024; STAD 1204, Covers LSM1, LSM2, and KI1
- Assessment 2 (Exam 2): Nov. 7, 2024; STAD 1204, Covers LSM3 and KI2
- Assessment 3 (Exam 3): Dec. 11, 2024, 9:40 am - 11:40 am; STAD 1204, 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: Please see the Math Foundation Canvas course for details about the components of the extra credit.

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## 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)
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## CSU Honor Pledge ([link ↗ \(https://tilt.colostate.edu/Integrity/Pledge\)](https://tilt.colostate.edu/Integrity/Pledge))

- Past tense: HONOR PLEDGE: "I have not given, received, or used any unauthorized assistance."
- Future tense: HONOR PLEDGE: "I will not give, receive, or use any unauthorized assistance."

## Working together

Working together on general study is encouraged. Of course, any assignment or exam you turn in *must be solely your own work*. Academic dishonesty has serious consequences (see below).

## Academic integrity

The faculty expects every member of the CSU community to practice honorable and ethical behavior both inside and outside the classroom. This course will adhere to the CSU Academic Integrity Policy as found on the Student Responsibilities page of the CSU General Catalog and in the Student Conduct Code. By handing in homework, quizzes, and tests/exams, you certify that this is your own work. Any actions that might unfairly improve a student's score on homework, quizzes, tests, or examinations will be considered academic misconduct and will not be tolerated. Examples of academic misconduct include (but are not limited to):

- Sharing results or other information for assignments (quiz, homework, test, etc.).
- Using forbidden material or devices.
- Submitting assignments that is not your own work or engaging in forbidden homework collaborations.
- Representing as your own work anything taken from the work of someone else. This includes all material that you did not create yourself. If you wish to quote or use something that you did not create, you must acknowledge it by including the exact source information.
- Using answers to questions posted online.

**Important:** The use of online "homework helper" sites including, but not limited to, Chegg, NoteHall, Quizlet and Koofers is **not permitted**. Use of these types of resources will be considered receiving unauthorized assistance and, therefore, a violation of the student conduct code.

At the professor's discretion, academic misconduct will result in a reduced score, a zero score, a failing grade for the course, and reporting to the CSU Student Resolution Center (and may result in additional University disciplinary action; if you are an international student, such disciplinary action could result in drastic consequences, such as losing your student-visa status). If there is any question as to whether a given action might be construed as academic misconduct, please contact the professor before you engage in any such action.

For more information, please see CSU's page on [Academic Honesty and Integrity ↗ \(https://tilt.colostate.edu/AcademicHI\)](https://tilt.colostate.edu/AcademicHI). For information on the Honor Pledge, see the [Honor Pledge ↗ \(https://tilt.colostate.edu/Integrity/Pledge\)](https://tilt.colostate.edu/Integrity/Pledge).

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## Disabilities

Colorado State University is committed to providing reasonable accommodations for all persons with disabilities. Students with disabilities who need accommodations must first contact Student Disability Center (SDC; [https://disabilitycenter.colostate.edu ↗ \(https://disabilitycenter.colostate.edu\)](https://disabilitycenter.colostate.edu)) before requesting accommodations for this class. Students who need accommodations in this course must contact the instructor in a timely manner (at least one week before exams) to discuss needed accommodations.