ME360: Signal Processing

Jan 12, 2026

Tue&Thur 9:00-10:20 am LTN-A 325

Course Description:
Introduction to signals and systems. Analog and digital signal processing and feedback control methods with emphasis on frequency domain techniques. Frequency response of continuous and discrete systems.

Instructors:
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Teaching Assistants:
TBD

Prerequisite: ME 340. Students may not receive credit for both this course and ABE 425.

Assessment: Homework: 25%, Labs: 10%, Midterm: 25%, Final: 35%, Attendance: 5%.

Attendance: Use Dingtalk devices to take attendance. The first absence will be excused without penalties. Each subsequent absence without proper leaves will lead to a 1% deduction from your overall performance until a cumulative deduction of 5% is reached.

Text: Ambardar, *Analog and Digital Signal Processing*, 2nd Ed., 1999.

Reference Books: Oppenheim, Willsky, Nawab, Hernández, *Signals & Systems*, Pearson Educación; 1997. Cochin and Cadwallender, *Analysis and Design of Dynamic Systems*, 3rd Ed, 1997.

Grading Policy:
There will be approximately bi-weekly homework assignments in this course, which will be released on the course website on Thursdays. You are encouraged to collaborate and cooperate with your peers on these assignments; however, you should only hand in your own original efforts. Evidence of plagiarism will be dealt with seriously. Late homework, will not be accepted; however, your lowest homework grade will be dropped.

Topics:

- Review of discrete- and continuous-time signals; signal operations; energy, power signals
- Real and complex Fourier series in continuous time
- System frequency response, Fourier transform
- Impulse response and convolution for continuous time systems

- Sampling theory and introduction to aliasing
- Signal conversion techniques (A/D, D/A), signal reconstruction
- Discrete-time Fourier series (DTFS); discrete-time Fourier transform (DTFT)
- Discrete Fourier transform (DFT), windowing, and Fast Fourier transform (FFT)
- Linear systems, stability, intro to analog filter design
- Laplace transform: one-sided; two-sided
- Discrete-time systems and z-transforms
- Introduction to digital filter design
- Introduction to feedback control system, loop stability and PID control

Tentative Schedule and Readings:
Labs:

- Lab 1: Introduction to Laboratory Instruments
- Lab 2: Signal Conditioning and Analog-to-digital Signal Conversion
- Lab 3: Noise Reduction Techniques, Instrumentation Amplifiers, and Strain Gauge Measurements
- Lab 4: Equalizing Audio Signals, Edge Detection in Images
- Lab 5: System Identification with Frequency Response Techniques using the Dynamic Signal Analyzer

UIUC Lab Website:
`http://coecsl.ece.illinois.edu/me360/`

Week	Tentative Lecture Schedule	Readings (Textbook)	Lab	HW
1	Overview Basics of Signals	Ch. 1 Ch. 2.1	No Lab	
2	Operations on Signals Complex Harmonics, Special Signals	Ch. 2.2-2.3 Ch. 2.4 Ch. 2.6	No Lab	HW 1
3	Fourier Series	Ch. 8.1	Lab 1	
4	Linear Systems, Fourier Transform Fourier Transform	Ch. 4.2 Ch. 9	No Lab	HW2
5	Fourier Transform	Ch. 9	Lab 2	
6	Discrete-Time Signals and Frequency Sampling Theorem and Aliasing	Ch. 3.1-3.5 Ch. 3.6	No Lab	HW3
7	Signal Reconstruction Review Sampling Theorem	Ch. 14.2 Ch. 3.6 Ch. 14	Lab 3	
8	Discrete-Time Fourier Series and Transform	Ch. 15		HW4
9	Connections Between Fourier Transforms Discrete-Time Convolution	Ch. 15. 2 Ch. 7	Lab 4	
10	Discrete Fourier Transform Inverse Discrete Fourier Transform	Ch. 16	No Lab	HW5
11	Finite Impulse Response Filters, DFT and FFT Analog Systems	Ch. 20, Ch. 16 Ch. 4	Lab 5	
12	Linear Systems	Ch. 4		HW6
13	Impulse Response and Stability Laplace Transform	Ch. 4 Ch. 11		HW7
14	Z-Transform and ROC Inverse Z-Transform	Ch. 17 Ch. 17.5		