ECE 315: Signals and Systems I

Catalog Description

Fundamentals of signals and systems including fundamental signals, basic system properties, linear time invariant systems, Fourier series, Fourier transforms, and filters. This is the first course in a sequence of two: ECE 315 and ECE 316 and must be taken in sequence.

Credit Hours: 4

Goals

The objective of this course is to provide students with a rigorous understanding of linear time invariant systems and the relationship to Fourier transforms.

Course Coordinator and Committee

James McNames (coordinator)
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Textbook

Signals and Systems: Analysis Using Transform Methods and MATLAB, third edition, M. J. Roberts, McGraw-Hill,

New York (2018) ISBN 978-0-07-802812-0.

The course instructor may choose to use a different textbook. Please check with your instructor before purchasing.

Prerequisites

ECE 223, MTH 253, MTH 256

Learning Outcomes

At the end of this course, students will be able to:

- Determine the mathematical representation of signals and systems including energy, power. Determine system response to signal inputs such as impulse, unit step and complex exponentials.
- Compute the convolution sum and integral of linear time-invariant systems and interpret the impulse response.

- Determine the Fourier series representation of continuous and discrete time signals
- Determine the Fourier transform of continuous signals.
- Determine the discrete time Fourier transform of discrete time signals
- Determine the discrete Fourier transform and the Fast Fourier Transform of discrete periodic signals.
- Determine the output response of IIR and FIR digital filters.

Topical Outline

- Signals and Systems Fundamentals
- Linear Time Invariant Systems
- Fourier Series Representations
- Continuous-Time Fourier Transform
- Discrete-Time Fourier Transform
- Time and Frequency Characterization of Signals and Systems

Course Structure and Grading Criteria

Teaching method will primarily be two-hour lectures twice each week. The grade will be based on midterms (40%), reading quizzes (15%), homework assignments (mathematical and applied) (15%), and a final exam (30%). The grading criteria may vary with instructor. Please refer to the syllabus for your section for details.

Relevant Student Outcomes

The following program outcomes are supported by this course:

(1) An ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics

(2) An ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors

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