Signals and systems (for EL&IC)

Shkel Yanina

Summary
This class teaches the theory of linear time-invariant (LTI) systems. These systems serve both as models of physical reality (such as the wireless channel) and as engineered systems (such as electrical circuits, filters and control strategies).

Content
The design of advanced systems (such as WiFi, cell phones, drones, airplanes) requires a thorough theoretical underpinning. This class teaches one of the most powerful and important pillars: The theory of linear time-invariant (LTI) systems. These systems serve both as models of physical reality (such as the wireless channel) and as engineered systems (such as filters and control strategies).

The class will cover the following topics:
1. Systems: Definitions (1 week)
2. LTI Systems (3 weeks)
3. The Frequency Response of stable LTI Systems (1 week)
4. Fourier Techniques for stable LTI Systems (3 weeks); with applications to Communication Systems and Signal Processing
5. Laplace and Z-Transform Techniques for LTI Systems (5 weeks); with applications to Control Systems

Keywords

Learning Prerequisites
Required courses
Analysis I, II, III. Linear algebra I.

Recommended courses
Linear algebra II

Learning Outcomes
By the end of the course, the student must be able to:
• Describe properties of LTI systems
• Solve for poles and zeros of LTI systems
• Recall properties of CT Fourier transform
• Analyze LTI systems by spectral analysis
• Operate with Fourier transform tools
• Work out / Determine impulse response of CT LTI

Teaching methods
• Classroom lectures
• Written exercises
• Graded homework problems

Expected student activities
• Read course book in english (the course is taught in english)

Assessment methods
Homeworks and written mid-term exam and final exams

Resources
Bibliography
The following is a recommended (but not required) book:

Ressources en bibliothèque
• A. V. Oppenheim and A. S. Willsky, with S. Hamid Nawab, Signals and Systems

Notes/Handbook
will be made available