

### Course Description

This is an accelerated and intensive course on signals and system analysis. The course covers continuous- and discrete-time Fourier series, Fourier transform, Laplace Transform, interactions between signals, linear time invariant systems, differential and difference equations, and the sampling theorem. There will also be an introduction to advanced concepts and related applications, such as various transforms used in image processing and modulation techniques used in communication systems, which will allow students to develop a deeper understanding of the fundamentals of signals and systems. MATLAB will be introduced as an integral part of this course. *Exclusion(s):* ELEC 2100 *Prerequisite(s):* (ELEC 1100 OR ELEC 1200 OR ELEC 2400 OR ELEC 2410 (prior 2016-17)) AND Grade A- or above in (MATH 2011 OR MATH 2023 OR MATH 2111 OR MATH 2350 OR MATH 2351 OR MATH 2352)

### List of Topics

1. Signals & Systems
2. Linear Time-Invariant Systems
3. Fourier Series Representation of Periodic Signals
4. The Continuous-Time Fourier Transform
5. The Discrete-Time Fourier Transform
6. Sampling
7. Communication Systems
8. Differential equations and Laplace Transform

### Statement of Objectives/Outcomes:

On successful completion of this course, students will be able to:

CO1 - Describe Basic Continuous Time and Discrete Time signals and different ways to make use of and manipulate them

CO2 - List the Properties of LTI systems and to determine the output of an LTI system using the impulse response and the convolution sum/integral, and the frequency response and transform

CO3 - Correctly apply the appropriate transform (FS, DTFS, FT DTFT) to produce a Frequency domain representation for continuous-time/discrete-time and periodic/aperiodic signals, and relate basic operations in the time and frequency domains

CO4 - State and prove the sampling theorem

CO5 - Analyze differential and difference equations as causal LTI systems and to realize them in different block diagram forms

CO6 - Apply theories learnt to the analysis of communication systems including Amplitude Modulation and Frequency Division Multiplexing, mechanical systems, and new problems

CO7 - Use the Software Tools Matlab to manipulate, process, analyze and plot signals

Textbook(s):

Alan V. Oppenheim, Alan S. Willsky and S. H. Nawab, *Signals and Systems*, Prentice-Hall International Editions, 2nd Edition

Relationship of Course to Program Outcomes:

Please refer to the Report Section 4.3.2 (iii).

Grading Scheme:

Homework	8%
Laboratory exercises	8%
Quiz	8%
Midterm Examination	30%
Final Examination	46%