MANIPAL UNIVERSITY JAIPUR

School of Electrical, Electronics & Communication Engineering (SEEC)

Department of Electronics & Communication Engineering
Course Hand-out

Signals and Systems| EC 1305 | 4 Credits | 3 1 0 4

Session: Jan 14– May 15| Faculty: Mr.Sudhendu Das Mahapatra, and Mr. Tejpal | Class: Core

Introduction: This course is offered by Dept. of Electronics and Communication Engineering as a core theory subject. This course is an introduction to the basic concepts and theory of analog and digital signal processing. The background assumed is calculus, experience in manipulating complex numbers, and some exposure to differential equations. Prior exposure to the fundamentals of circuits for electrical engineers, is helpful but not essential.

Both for pedagogical reasons and as a reflection of the nature of modern signal processing systems, the concepts associated with continuous-time and with discrete-time signals and systems are treated together in a closely coordinated way. Among other things, this approach emphasizes both the similarities and the differences in the two classes of systems.

A. Course Outcomes: At the end of the course, students will be able to

[1405.1] Acquire knowledge about continuous & discrete-time signals, implement time domain properties on various signals to perform basic operations on signals and able to identify different types of systems.

[1405.2] Inculcate vision to identify signals and demonstrate its usage to solve problems using Fourier transform and Fourier series.

[1405.3] Foster ability to demonstrate problem solving using Laplace transform.

[1405.4] Demonstrate ability to solve problems in discrete time domain using Z transform and enhance the employability.

B. SYLLABUS

Introduction to signals and systems: Definitions, Overview of specific systems, Classification of signals, Basic operations on signals, Elementary signals and functions, Systems viewed as interconnections of operations, properties of systems; **Time domain representations for Linear time-invariant systems**: Introduction, Convolution, Impulse response representation for LTI systems, properties of the impulse response representation for LTI systems, Differential and difference equation representations for LTI systems, Block diagram representations; **Fourier representation for signals**: The discrete-time Fourier series, continuous-time periodic signals: The Fourier series, Discrete-time non-periodic signals; **Applications of Fourier representations**: Introduction, Frequency response of LTI systems, Fourier transform representations for periodic signals Properties of Fourier transform, convolution and modulation with mixed signal classes; energy, power, parseval's theorem, spectra of signals, cross correlation and auto correlation, power and energy spectral density; **Applications of Laplace transform**: Continuous Time System Analysis using Laplace transform, Region of convergence and Stability, Analysis of continuous time signals and systems; **Z-Transform**: Introduction, the Z-transform, properties of the Region of convergence, Properties of the Z-Transform, Inversion of the Z-Transform, Transform analysis of LTI systems, pole-zero analysis, stability, the unilateral Z-Transform; **Sampling of Continuous-Time Signals**: Introduction, periodic sampling, Frequency domain Representation of sampling, Reconstruction of Band-limited Signal from its Samples.

C. REFERENCE BOOKS

i. S. Haykin & B. V. Veen, *Signals and Systems*, John Wiley &Sons, New Delhi, 2005.
ii. A.V. Oppenheim, A. S. Willsky & A. Nawab, *Signals and Systems*, PHI. /Pearson Education, New Delhi, 2002.
iii. H. Hsu, R. Ranjan, *Signals and Systems*, Schaums's outline, Tata McGraw – Hill, New Delhi, 2006.
iv. B. P. Lathi, *Linear systems and Signals*, Oxford University Press, 2005.
v. Simon Haykin , Barry Van Veen Signals and Systems, Wiley