| EC214 | SIGNALS AND SYSTEMS | L | T | P | C | Int | Ext |
|---|---|---|---|---|---|---|---|
| | | 2 | 1 | - | 3.0 | 30 | 70 |

**Semester III [Second Year]**

**COURSE OBJECTIVES:**

1. To know the types of signals and characterisation of discrete and continuous LTI systems.
2. To characterize discrete and continuous LTI systems in terms of impulse and frequency responses.
3. To understand convolution and correlation functions and sampling theorem.
4. To know the properties and applications of Laplace Transforms.

**COURSE OUTCOMES:**

**After successful completion of the course, the students are able to**

1. demonstrate knowledge in Representation of signals and systems, Fourier series representation of periodic signals, Fourier transform of signals, Convolution and correlation of functions.
2. apply convolution and correlation for signal comparison and find the response of LTI systems.
3. understand the sampling theorem, reconstruction techniques and aliasing effects.
4. apply Laplace transform techniques for analyzing signals and systems.

**UNIT I** *Text Book - 1,2* [CO:1] **(12)**

**Signal Analysis:** Introduction to signals and systems, Classification of signals, Basic Operations on Signals, Elementary Signals, Systems viewed as Interconnection of Operations, Properties of Systems.

Trigonometric and Exponential Fourier series, Relationship between Trigonometric and Exponential Fourier series, Representation of a periodic function by the Fourier series over the entire interval, Convergence of Fourier series, Alternate form of Trigonometric series, Symmetry conditions, Complex Fourier spectrum.

**UNIT II** *Text Book - 1,2* [CO:1] **(12)**

**Representation of an arbitrary function over the entire interval:** Fourier transform, Fourier transform of some useful functions, Singularity Functions, Fourier transform of periodic function, Some Properties of Fourier transforms, Energy Density spectrum.

**UNIT III** *Text Book - 1,2* [CO:1,2] **(12)**

**Time Domain Representations for LTI systems:** Convolution, Impulse response Representation for LTI systems, Properties of Impulse response representation for LTI systems, Impulse and Frequency response of LTI system, Conditions for Distortion less Transmission, Ideal low pass filter, Frequency and Impulse response of ideal low pass filter, Paley-Wiener criterion.

**Signal Comparison:** Correlation and convolution, some properties of correlation functions, and correlation functions for non-finite energy signals.

**UNIT IV** *Text Book - 1,2* [CO:1,3,4] **(12)**

**The Sampling Theorem and its implications, Reconstruction:** ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects.

The Laplace Transform, region of convergence, the inverse Laplace transform, Properties of the Laplace transform, Problems.

**LEARNING RESOURCES:**

**TEXT BOOK(s):**

1. B.P. Lathi - Signals, Systems and Communications, BS Publications 2003.
2. Tarun Kumar and Rawat - Signals and Systems, Oxford Publications, 2010.

**REFERENCE BOOK(s):**

1. A.V.Oppenheim, A.S.Willsky and S.H.Nawab - Signals and Systems, 2nd Edition, PHI,2009.
2. A.Anand Kumar - Signals and Systems, PHI Learning, 3rd Edition, 2012.

**WEB RESOURCES:**

http://nptel.iitm.ac.in/courses/