SIGNAL PROCESSING FOR COMMUNICATIONS

17ECMC2T2 **Credits: 4**

Lecture: 4 periods/week **Internal assessment: 40 marks**

Semester end examination: 60 marks

Prerequisites: Digital Signal Processing, Communications.

Course Objectives:

- To explore the concept of space (Vector and Hilbert) and fourier analysis.
- To design FIR and IIR filters.
- To explore the concepts of Stochastic and Multiratesignal processing.
- To design communication system.

LearningOutcomes:

Students will be able to

- DescribeVector and Hilbertspaces.
- Design various digital filters.
- Discuss about Stochastic and Multirate processing.
- Design communication system.

UNIT-I

Signals and Hilbert Spaces: Euclidean Geometry: a Review, From Vector Spaces to Hilbert Spaces, Subspaces, Bases, Projections, Signal Spaces.

Fourier Analysis: Preliminaries, DFT (Discrete Fourier Transform), DFS (Discrete Fourier Series), DTFT (Discrete-Time Fourier Transform), Relationships between Transforms Fourier Transform Properties, Fourier Analysis in Practice, Time-Frequency Analysis, Digital Frequency vs. Real Frequency

UNIT-II

Discrete-Time Filters:Linear Time-Invariant Systems, Filtering in the Time Domain, Filtering by Example – Time Domain, Filtering in the Frequency Domain, Filtering by Example – Frequency Domain, Ideal Filters.

Filter Design: Design Fundamentals, FIR Filter Design, IIR Filter Design, Filter Structures, Filtering and Signal Classes.

UNIT-III

Stochastic Signal Processing: Random Variables, Random Vectors, Random Processes, Spectral Representation of Stationary Random Processes, Stochastic Signal Processing.

Multirate Signal Processing: Downsampling, Upsampling, Rational Sampling Rate Changes, Oversampling.

UNIT-IV

Design of a Digital Communication System: Communication Channel, Modem Design: Transmitter, Modem Design: Receiver, Adaptive Synchronization.

Textbooks:

1. Signal Processing For Communications: Pzdesign communication system. Paolo Prandoni and Martin Vetterli, EPFL Press.