

## EC-431 Digital Communication - Course Contents

a. **Credits:** 2+1

a. **Text Book:** Digital Communications: Fundamentals and Applications, Bernard Sklar, Prentice Hall, Latest Issue.

b. **References:**

1. Communication Systems Engineering, John G. Proakis and Masoud Salehi, Prentice Hall, 2002
2. Introduction to Digital Communications, Michael B. Pursley, Pearson, Prentice Hall, 2005
3. Digital communications, Ian A. Glover and Peter M. Grant, Pearson, Prentice Hall, 2004

c. **Objectives/Goals:** The course focuses on fundamental issues in designing and analyzing digital communication system (DCS). This course is concerned with the requirements and limitations of digital transmission as used for fixed and mobile telephony, wired and wireless computer networks, data storage & digital broadcasting. This is a vast and rapidly advancing subject with many aspects that are new and only recently introduced into textbooks, though often these new aspects are based on older ideas seen in a new light. To be able to appreciate the technology currently available and participate in its development there are some fundamental ideas that must be understood, a large number of technical terms and acronyms that one must become familiar with and some conceptualizing skills that must be acquired. To learn some of these fundamental ideas, terms and skills is the purpose of our course.

d. **Course Outcomes:** On completion of the course, the students will be able to answer the following questions:

1. How to transmit the information from source to destination?
2. What is the quality of received information?
3. Is the quality good enough or should be improved?
4. If to be improved then how and at what cost?
5. What are different modulation techniques?
6. What is ISI and how to compensate by different techniques?
7. What are different trades offs to achieve better communication system?

**f. Topics:**

1. Digital Communications Basic Blocks, Introduction
2. Classification of signals ,Deterministic and Random, Periodic and Non-periodic  
Signals, Energy and Power Signals, Analog and Discrete Signals
3. Spectral Density, Auto-Correlation, Random Signals
4. Bandwidth of Digital Signals, Baseband versus Band pass
5. Sampling Theorem, Aliasing, Over Sampling
6. Sampling and Quantizing effects, Channel effects, Signal to Noise Ratio
7. Pulse Code Modulation, PCM based Time division multiplexing
8. Uniform and Non Uniform Quantization, Companding
9. Waveform Representation of Binary Digits, M-ary Pulse Modulation waveforms
- 10.PCM waveform types, Line Coding
- 11.Correlative Coding, duo-binary coding and decoding, precoding
- 12.Error Performance, degradation in Digital Communication System, Demodulation and detection, SNR parameter in Digital Communication System
- 13.Detection of Binary Signals in Gaussian Noise, Matched Filter
- 14.Inter symbol Interference, Pulse shaping to reduce ISI, Error Performance
- 15.Eye Patterns, Digital Demodulation Techniques
- 16.Spread Spectrum, Frequency Hopping and Direct Sequence