ANALOGUE AND DIGITAL COMMUNICATIONS

(Core Subject)

Course Code:	17B11EC412	**Semester:**	4th Semester, B. Tech (ECE)
Credits:	4	**Contact Hours:**	L-3, T-1, P-0

Course Objectives

The objectives are to study

1. To introduce the basic concepts of analogue and digital communication systems, and to equip students with various modulation techniques used for communication.

Course Outcomes

After studying this course the students would gain enough knowledge

1. The students will have the knowledge of components of analogue communication system.
2. The students will have the ability to analyze the concept of various methods used for baseband/band pass analogue transmission and detection.
3. The students will be able to evaluate the performance of analogue communications in the presence of noise.
4. The students will have the knowledge how we can covert analog signal to digital signal with the help of sampling and PCM.
5. The students will have the knowledge of components of digital communication system.
6. The students will have the ability to analyze various modulation methods for transmission of digital information.

Course Contents

Unit	**Topics**	**References (chapter number, page no. etc)**	**Lectures**
1.	Elements of an electrical communication system; Characteristics of communication channel and their mathematical modeling; Signal models: deterministic and random; signal classification; Convolution Integral and response of LTI system; Fourier series representation, Parseval's theorem; Fourier transform; Probability theory, Random Process: mean, correlation and covariance; stationary and ergodic processes; power spectral density; Gaussian Process.	Simon Haykin : Chapter 2	4
2.	Concept of modulation and demodulation, Continuous wave (CW) modulation: amplitude modulation (AM) - double sideband (DSB); double sideband suppressed carrier (DSBSC); single sideband suppressed carrier (SSBSC) and vestigial sideband (VSB) modulation, angle modulation - phase modulation (PM) &	B.P.Lathi : Chapter 2 ,3 & 12	13

	frequency modulation (FM); narrow and wideband FM. Representation of narrowband noise; receiver model, signal to noise ratio (SNR), noise figure, noise temperature, noise in DSB-SC, SSB, AM & FM receivers, pre-emphasis and de-emphasis		
3	Sampling process, sampling theorem for band limited signals; pulse amplitude modulation (PAM); pulse width modulation (PWM); pulse position modulation (PPM) ; pulse code modulation (PCM); line coding; differential pulse code modulation; delta modulation and adaptive delta modulation, Basics of time division multiplexing, noise consideration in PAM and PCM systems.	B.P.Lathi : Chapter 6 Simon Haykin : Chapter 5	10
4	Overview of geometric representation of signals, Gram-Schmidt Orthogonalization procedure; Basic digital modulations schemes: Phase shift keying (PSK), amplitude shift keying (ASK), frequency shift keying (FSK) and Quadrature amplitude modulation (QAM); coherent demodulation and detection; probability of error. Basics of equivalent complex baseband representation of digitally modulated signals.	Simon Haykin : Chapter 7	10
5	Measure of information, Source encoding, Error free communication over noisy channel, Channel capacity of discrete memory less channel, Channel capacity of continuous memory less channel, Frequency selective channel capacity, MIMO communication system. Introduction, Redundancy for error correction, Linear block codes, Cyclic codes, Effect of error correction, Convolution codes, Trellis diagram of block codes	Robert G. Gallager :	7
		Total Number of Lectures	44

Evaluation Scheme

1. Test 1 :15 marks
2. Test 2 : 25 marks
3. Test 3 : 35 marks
4. **Internal Assessment** : 25 marks
    - 10 Marks : Class performance, Tutorials & Assignments
    - 10 Marks : Quizzes
    - 5 marks : Attendance

Text Books

1. Haykin, Simon : An introduction to analog and digital communications. John Wiley & Sons.
2. Lathi, B.P. : Modern Analog and Digital Communication Systems. Oxford.
3. Taub, Schilling. : Principles of Communication Systems, McGrawHill.
4. Carlson, Crilly : Communication Systems, McGrawHill.
5. Information theory and Reliable communication, Robert G. Gallager, Wiley.

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