



**Subject Code: 01CT0404**

**Subject Name: Analog and Digital Communication**

**B. Tech. Year – II (Semester IV)**

**Objective:**

This course explores the fundamentals of electronic communication systems it provides the knowledge of various analog and digital modulation and demodulation techniques used in communication system. Comparison of various techniques will enable the student to select most appropriate technique for the application

**Credits Earned:** 04 Credits

**Course Outcomes:** After completion of this course, student will be able to:

1. To understand basics of analog and digital communication techniques.
2. To learn working of AM-FM Transmitters and receivers.
3. To facilitate the understanding of the baseband and carrier modulation.
4. To understand the effect and performance of communication systems in presence of noise.
5. Analyze Communication System based on different Modulation & Demodulation Techniques and analyze performance.

**Pre-requisite of course:**

Basic electronics, Digital Electronics, Basic Mathematics and Introduction to communication engineering

**Teaching and Examination Scheme:**

Teaching Scheme (Hours)			Credits	Theory Marks			Tutorial / Practical Marks		Total Marks
				E	I		V	T	
Theory	Tutorial	Practical		ESE	IA	CSE	Viva	Term Work	
03	00	02	04	50	30	20	25	25	150



**Contents:**

Unit	Topics	Hours
1	<b>Linear Modulation: Amplitude modulation</b> Concept of amplitude modulation, Double Sideband suppressed carrier modulation, Single side band suppressed carrier modulation, Generation of AM-Chopper circuit, Balanced modulator, Modulation by multitone modulating signal. Independent Side band, Theme example- VSB transmission of Analog and Digital Television.	08
2	<b>Angle modulation</b> Concept of instantaneous frequency and phase modulation, sinusoidal FM and its time domain representation, spectral components of angle modulated signals, power in sinusoidal FM and modulation index, Carson's rule, Multitone wideband FM, Generation of Wideband FM from Narrow band FM, Generation of WBFM by Armstrong method.	06
3	<b>Noise in communication systems</b> Classification of noise, Signal to noise ratio (SNR), Noise factor and noise figure, Equivalent input noise generators, Noise temperature, Narrow band noise, PSD of in-phase and quadrature noise, Noise performance in AM, FM, Digital baseband and carrier communication systems, Concept of optimum threshold detection, matched filter, correlation receiver, optimum binary receiver, bit error rate (BER).	05
4	<b>Base Band Modulation</b> Base band system, sampling theorem, Sampling and signal reconstruction, Aliasing, Types of sampling, Quantization, PCM, Companding, DPCM, ADPCM, Delta modulation, Adaptive delta modulation. Theme Example-Digitization of video and MPEG.	11
5	<b>Digital Modulation Techniques</b> Modulation techniques for ASK, QASK, FSK, M-ary FSK, BPSK, DPSK, QPSK, M-ary PSK, QAM. Comparison of Noise performance of various PSK and FSK systems. Theme Example- Orthogonal Frequency Division Multiplexing (OFDM).	12
<b>Total Hours</b>		42

**Suggested Text books / Reference books:**

1. Electronic Communications by Kennedy McGraw Hill Publication.
2. Electronic Communications by Dennis Roddy & John Coolen IV Edition PHI.
3. Communication Systems: Analog and Digital by R. P. Singh and B. D. Sapre, Tata-McGraw Hill.



4. Modern Digital and Analog Communication Systems, B. P. Lathi, (3rd Edition), Oxford Publication
5. Principles of Communication Systems, Taub & Schilling, (2nd Edition), Tata McGraw Hill Publication.

### **Suggested Theory distribution:**

The suggested theory distribution as per Bloom's taxonomy is as per follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process.

Distribution of Theory for course delivery and evaluation					
Remember	Understand	Apply	Analyze	Evaluate	Create
10%	25%	25%	20%	10%	10%

### **Suggested List of Experiments:**

Minimum 12 experiments to be performed during the semester

1. To observe amplitude modulation waveforms for different modulation index.
2. To observe frequency modulation waveform and to measure peak frequency deviation.
3. To observe frequency spectrum of AM and FM waveforms.
4. To understand block diagram of AM receiver and observe signals at different stages.
5. To understand block diagram of FM receiver and observe signals at different stages.
6. To Study and Perform sampling theorem and reconstruction.
7. To perform TDM-PCM Transmission and Reception.
8. Experiment on Companding techniques
9. To study Delta Modulation.
10. To transmit and receive digital signal using Amplitude shift keying.
11. To transmit and receive digital signal using Frequency Shift Keying.
12. 12 To transmit and receive digital signal using Phase Shift Keying (BPSK and QPSK)
13. Simulation of various analog and digital modulation and demodulation techniques
14. Simulation of effect of noise in communication systems

### **Supplementary Resources:**

1. [https://www.tutorialspoint.com/digital\\_communication/digital\\_communication\\_analog\\_to\\_digital.html](https://www.tutorialspoint.com/digital_communication/digital_communication_analog_to_digital.html)
2. <https://www.classcentral.com/course/swayam-analog-communication-13893>
3. <https://www.udemy.com/course/analog-communication>