GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3163206

ANALOG AND DIGITAL COMMUNICATION

6th SEMESTER

Type of course: Undergraduate

Prerequisite: Communication Fundamentals

Rationale: Analog and digital communication includes techniques of analog and digital modulation and demodulation as well as the transmitter and receiver designs for the communication systems.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
4	0	2	5	70	30	30	20	150

Content:

Sr. No.	Content	Total Hrs.	% Weightage
1	**Introduction to communication systems:** Elements of Communication System, Need for modulation, Technologies in Communication Systems, Signal representation and analysis.	**03**	**06**
2	**Noise:** External noise, Internal noise, Noise calculations, Noise figure, Noise temperature.	**04**	**10**
3	**Amplitude modulation techniques:** Elements of Analog Communication, Amplitude Modulation index, Modulation index for sinusoidal AM equation, Amplitude modulation techniques, Double sideband suppressed carrier modulation, Single sideband suppressed carrier modulation, Generation of AM signals: Amplitude Modulators, Amplitude demodulator circuits, Amplitude-modulated Transmitters.	**08**	**15**
4	**Angle modulation techniques:** Introduction, Frequency Modulation, Sinusoidal FM, Frequency Spectrum for Sinusoidal FM, Non-sinusoidal modulation-Deviation ratio, Measurement of modulation index for sinusoidal FM, Phase modulation, Equivalence between PM and FM, sinusoidal phase modulation, Angle modulator circuits, angle modulation detectors, Automatic Frequency Control, Practical Issues in FM, pre-emphasis and de-emphasis system.	**08**	**15**
5	**Radio Transmitters and Receivers:** Introduction to Radio Communication, Radio Transmitters, Receiver types, AM receivers, FM receivers, SSB Receivers.	**08**	**20**
6	**Pulse Modulation techniques:** PAM, PWM, PPM, PCM, Quantization, Differential PCM, Delta modulation, Adaptive delta modulation, Adaptive differential PCM.	**08**	**10**
7	**Digital Modulation Techniques:** Introduction, Basic digital modulation techniques:	**06**	**08**

	ASK, FSK, PSK		
8	**Digital Demodulation Techniques:** Basic digital demodulation techniques: ASK, FSK, PSK	**06**	**08**
9	**Spread Spectrum Communications:** Introduction to Frequency hopping, Introduction to direct sequence Spread Spectrum, Introduction to CDMA, Overview of latest trends in digital communication.	**05**	**08**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
12	**20**	**24**	**6**	**4**	**4**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Electronic Communications, Dennis Roddy, John Coolen.
2. Electronic Communication Systems, George Kennedy, Bernard Davis, S R M Prasanna.
3. Modern Digital and Analog Communication Systems, by B. P. Lathi and Zhi Ding.
4. Communication Systems by by Simon Haykin, 4th edition, John Wiley & Sons Publication.

Course Outcome: After learning the course the students should be able to:

Sr. No.	**CO Statement**	**Marks % Weightage**
CO-1	Understand the importance of communication systems and effect of various noises associated with them.	15
CO-2	Implement the analog modulation techniques on various information signals.	25
CO-3	Use the transmitters and receivers for different communication systems.	25
CO-4	Identify different pulse modulation techniques.	10
CO-5	Perform digital modulation techniques for digital communication systems.	25

List of Experiments:

1. To study the block diagram of AM broadcast transmitter.

2. To study the circuit of AM modulation & calculation of modulation index.
3. To study frequency modulation & calculation of modulation index.
4. To study block diagram of AM receiver.
5. To study Characteristics for pre-emphasis & de-emphasis circuits.
6. To generate amplitude modulation (AM) waveform and to measure modulation index of AM wave using waveform method and trapezoidal method.
7. To study and perform PAM, PWM, PPM.
8. To understand the concept of Pulse Code Modulation and to observe the performance of PCM system.
9. To Study and observe the performance of Digital carrier system—ASK.
10. To Study and observe the performance of Digital carrier system—FSK.
11. To Study and observe the performance of Digital carrier system—PSK

Design based Problems (DP)/Open Ended Problem:

1. Error detection and correction in MATLAB.
2. Designing a schematic of modulator and demodulator in simulation software.

Major Equipment:

1. AM / FM modulator – demodulator kit
2. PCM kit
3. ASK / PSK modulator – demodulator kit
4. MATLAB

List of Open Source Software/learning website:

1. www.nptel.ac.in