

GUJARAT TECHNOLOGICAL UNIVERSITY

INFORMATION AND COMMUNICATION TECHNOLOGY (32)

ANALOG AND DIGITAL COMMUNICATION (ICT)

SUBJECT CODE: 2163206

B.E. 6th SEMESTER

Type of course: Electronic Communication

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 C | Examination Marks | | | | | | Total Marks |
|-----------------|---|---|--------------|-------------------|--------|-----|-----------------|----|-----------|----------------|
| L | T | P | | Theory Marks | | | Practical Marks | | | |
| | | | | ESE (E) | PA (M) | | ESE (V) | | PA (I) | |
| | | | | PA | ALA | ESE | OEP | | | |
| 4 | 0 | 2 | 6 | 70 | 20 | 10 | 20 | 10 | 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. | 3 | 6 |
| 2 | Noise: External noise, Internal noise, Noise calculations, Noise figure, Noise temperature | 4 | 10 |
| 3 | Amplitude modulation techniques: Elements of Analog Communication, Amplitude modulation techniques, Generation of AM signals | 7 | 15 |
| 4 | Angle modulation techniques: Theory of Angle Modulation techniques, Practical Issues in FM, Generation of FM. | 7 | 15 |
| 5 | Radio Transmitters and Receivers: Introduction to Radio Communication, Radio Transmitters, Receiver types, AM receivers, FM receivers, SSB Receivers. | 7 | 20 |
| 6 | Pulse Modulation techniques: Pulse Analog modulation techniques, Pulse Digital Modulation techniques. | 6 | 10 |
| 7 | Digital Modulation Techniques : Introduction, basic digital modulation techniques: ASK, FSK, PSK | 6 | 8 |
| 8 | Digital Demodulation techniques : basic digital modulation techniques: ASK, FSK, PSK | 6 | 8 |

| | | | |
|----------|--|----------|----------|
| 9 | Spread Spectrum Communications : Introduction to Frequency hopping, Introduction to direct sequence Spread Spectrum, Introduction to CDMA, Overview of latest trends in digital communication. | 4 | 8 |
|----------|--|----------|----------|

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

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

- Understand how the analog and digital modulation occurs.
- Understand working of electronic communication system.

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 and 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 modular 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

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should submit to GTU.