

# GUJARAT TECHNOLOGICAL UNIVERSITY

Semester: 4

## Diploma in Electronics & Communication

Subject Name **COMMUNICATION ENGINEERING - II**

Sr.No	Course content
1.	<b>SINGLE SIDEBAND TECHNIQUES</b> 1.1 Principles of SSB 1.2 Advantages and disadvantage of SSB 1.3 Suppression of carrier using FET balanced modulator 1.4 Sideband suppression methods: filter method, phase shift method 1.5 Pilot carrier SSB and Independent sideband systems 1.6 Vestigial sideband transmitter 1.7 Frequency division multiplexing: Introduction, Block diagram and frequency spectrum of a simple FDM system combining four channels of 5 KHz bandwidth, FDM hierarchy
2.	<b>SSB RECEIVER AND COMMUNICATION RECEIVER</b> 2.1 SSB detector 2.2 Block diagram of single sideband (Pilot carrier) receiver and its working 2.3 Carrier synchronization techniques: Costas loop, squaring loop 2.4 Block diagram of independent sideband (ISB) receiver and its working 2.5 Block diagram of communication receive and function of each block 2.6 Extension of the super heterodyne principle: Double conversion, Squelch circuits, Noise limiter, Delayed AGC & Delayed Amplifier, Automatic frequency control
3.	<b>PULSE MODULATION</b> 3.1 Discretization in time (sampling process) : Statement of sampling theorem Nyquist rate, Nyquist interval, effect of undersampling (Aliasing) 3.2 Sampling techniques 3.2.1 Instantaneous sampling: principle, switching sampler circuit and waveforms 3.2.2 Natural sampling: principle, sampler circuit and waveforms 3.2.3 Flat-top sampling: principle, sample and hold circuit and waveforms 3.2.4 Comparison of the sampling techniques 3.3 Pulse modulation Technique 3.3.1 Pulse Amplitude Modulation: principle, modulator circuit, block diagram of PAM demodulator, drawbacks of PAM 3.3.2 Pulse Width Modulation: principle, modulator circuit using IC555, block diagram of PWM detector, merits and demerits of PWM 3.3.3 Pulse Position Modulation: principle, IC555 based PPM modulator circuit, block diagram of demodulator, merits and demerits of PPM 3.3.4 Comparison of PAM, PWM and PPM 3.4 Time Division Multiplexing: Principle, block diagram and operation of PAM-TDM system, transmission bandwidth of PAM-TDM signal.

4.	<p><b>SOURCE CODING AND MULTIPLEXING</b></p> <p>4.1 Discretization in amplitude (quantization process): Basics of quantization, step-size, resolution, quantization noise, uniform and non-uniform quantizer, companding</p> <p>4.2 Pulse Code Modulation (PCM): principle, PCM system, merits and demerits, block diagrams of PCM transmitter and PCM receiver, effect of noise on PCM signal and basics of regenerator repeater</p> <p>4.3 Delta modulation (DM): Concept, block diagrams of modulator and demodulator, advantages, slope overload and granular noise, concept of adaptive delta modulation (ADM)</p> <p>4.4 Differential PCM (DPCM): Concept, block diagrams of transmitter and receiver</p> <p>4.5 Comparison of PCM, DM, ADM and DPCM</p> <p>4.6 Channel coding techniques: RZ, NRZ, BiPolar, Manchester, Differential Manchester, HDB-3</p> <p>4.7 Digital multiplexing: Principle, advantages, 4-level multiplexing hierarchy, multiplexing of different types of signals</p> <p>4.8 PCM-TDM system</p> <p>4.8.1 Block diagram and operation</p> <p>4.8.2 Frame structure and synchronization</p> <p>4.8.3 Bit rate and bandwidth</p> <p>4.8.4 Channel associated signalling</p>
5.	<p><b>DIGITAL MODULATION</b></p> <p>5.1 Definitions: Information capacity, bit rate, symbol, baud rate</p> <p>5.2 Amplitude Shift Keying: Principle, waveforms</p> <p>5.3 Frequency Shift Keying: Principle, waveforms, transmitter, coherent and noncoherent receiver, minimum shift keying</p> <p>5.4 Phase Shift Keying</p> <p>5.4.1 Binary PSK: Principle, waveforms, constellation diagram, transmitter, receiver</p> <p>5.4.2 QPSK: Principle, waveforms, constellation diagram, transmitter, receiver</p> <p>5.4.3 8-PSK: Principle, constellation diagram</p> <p>5.5 Quadrature Amplitude Modulation: Principle, constellation diagram and waveforms</p>
6.	<p><b>DATA COMMUNICATION</b></p> <p>6.1 Introduction data communication techniques: Serial, parallel, asynchronous, synchronous</p> <p>6.2 Data communications hardware: DTE, DCE, PSTN</p> <p>6.3 Asynchronous serial data communication: Introduction, bit format</p> <p>6.4 Serial data transmission standards</p> <p>6.4.1 RS232: Overview, signals, pin functions, limitations</p> <p>6.4.2 RS422A: Overview, advantages</p> <p>6.4.3 RS530: Pin functions, category I and category II pins</p> <p>6.5 Synchronous serial data communication protocols</p> <p>6.5.1 BiSYNC: Introduction, message format and handshaking in half duplex communication</p> <p>6.5.2 SDLC: Introduction, frame format, data transfer process</p> <p>6.6 Data communication modems: Principle, types, and block diagram of an asynchronous FSK Modem</p> <p>6.7 UART and USB standards and different USB connectors</p> <p>6.8 Bluetooth communication technique</p>

## **LABORATORY EXPERIENCES:**

The sample experiments to be performed include, but are not limited to the following.

1. To study the communication receiver
2. To study and perform balanced modulator
3. To study and perform S.S.B. using filter method
4. To study and perform PAM
5. To study and perform PWM
6. To study and perform PPM
7. To study the fiber optic communication system
8. To study and perform FSK modulation and demodulation
9. To study and perform TDM
10. To study and perform ASK modulation and demodulation
11. To study and perform Delta modulation
12. To study noise limiter circuit
13. To study of different types of MODEMS
14. To study and perform asynchronous data transfer
15. To study synchronous data transfer protocols

## **Reference Books:**

1. Electronic communication systems - George Kennedy – TMH
2. Electronic communications - Dennis Reddy and John coolen - Pearson
3. Communication Systems (Analog and Digital) – Sanjay Sharma – S. K. Kataria and sons
4. Electronic communication systems: fundamentals through advanced- W. Tomasi – Person
5. Electronic communications - Sanjiv Gupta - Khanna
6. Microprocessors and interfacing: Programming and hardware – Douglas V. Hall - THM