



**PARVATHANENI BRAHMAYYA  
SIDDHARTHA COLLEGE OF ARTS & SCIENCE**  
*Autonomous*  
Siddhartha Nagar, Vijayawada-520010  
*Re-accredited at 'A+' by the NAAC*

<b>Course Code</b>				<b>23ELMAL233</b>			
<b>Title of the Course</b>				<b>ELECTRONIC COMMUNICATION SYSTEMS</b>			
<b>Offered to :</b>				B.Sc. (H)-Electronics			
<b>L</b>	<b>4</b>	<b>T</b>	<b>0</b>	<b>P</b>	<b>0</b>	<b>C</b>	<b>3</b>
<b>Year of Introduction:</b>		<b>2024-25</b>		<b>Semester:</b>			<b>3</b>
<b>Course Category:</b>		Major		<b>Course Relates to:</b>		Global	
<b>Year of Revision:</b>		N/A		<b>Percentage:</b>		N/A	
<b>Type of the Course:</b>				Employability			
<b>Crosscutting Issues of the Course :</b>				Professional Ethics			
<b>Pre-requisites, if any</b>				Familiarity with basic electronic components			

**Course description:**

The Electronic Communication Systems course provides students with a comprehensive understanding of the principles and technologies involved in the transmission and reception of information. This course covers both analog and digital communication techniques, including modulation, demodulation, signal processing, and data encoding. Students will explore various communication systems and standards, gaining practical experience through simulations and laboratory exercises. The course aims to equip students with the knowledge and skills necessary to design, analyse, and implement modern communication systems.

**Course Aims and Objectives:**

<b>S. N O</b>	<b>COURSE OBJECTIVES</b>
<b>1</b>	Understand the principles and applications of modulation, including AM and FM, and their associated frequency spectra, power relations, and generation techniques.
<b>2</b>	Analyze the design and functionality of radio transmitters and superheterodyne receivers, including FM transmitters and discriminators like balanced slope, phase, and ratio detectors.
<b>3</b>	Explore communication bands within the electromagnetic spectrum and pulse modulation techniques such as PAM, PWM, and PPM, including their generation, detection.
<b>4</b>	Gain proficiency in PCM systems, encompassing encoding, decoding, quantization noise analysis, and understanding the signal-to-noise ratio in digital communications over analog.
<b>5</b>	Evaluate the advantages of shift keying in digital communication, including ASK, FSK, and PSK techniques, and their respective generation and detection methods.

## Course Outcomes

At the end of the course, the student will be able to...

CO NO	COURSE OUTCOME	BT L	PO	PS O
CO1	demonstrate comprehensive understanding of AM, practical implementation with transistor modulators, and advanced techniques like carrier suppression using BM and SSB suppression via phase shift methods.	K2	1	1
CO2	proficiently comprehend FM theory, frequency spectrum analysis, and FM generation using Reactance Modulators.	K2	1	1
CO3	proficiently analyze and design radio communication systems, including AM and FM transmitters and receivers, integrating discriminators such as balanced slope, phase, and ratio detectors.	K4	1	1
CO4	demonstrate a comprehensive understanding of pulse modulation techniques, including PAM, PWM, and PPM.	K4	1	1
CO5	proficiently comprehend Pulse Code Modulation (PCM) principles and the generation/detection methods for ASK, FSK, and PSK in shift keying techniques.	K4	1	1

**For BTL: K1: Remember; K2: Understand; K3: Apply; K4: Analyze; K5: Evaluate; K6: Create**

CO-PO MATRIX									
CO NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	2							2	
CO2	2							3	
CO3	3							3	
CO4	3							3	
CO5	3							3	

**Use the codes 3,2,1 for High, Moderate and Low correlation Between CO-PO-PSO respectively**

### Course Structure:

#### Unit – I

Modulation, Need for modulation, Types of Modulation, amplitude modulation-frequency spectrum of AM wave, representation of AM, power relations in the AM wave, Generation of AM - Transistor modulator. Suppression of carrier using balanced modulator, suppression of one side band using phase shift method.

#### Examples/Applications/Case Studies:

- Uses amplitude modulation for transmitting audio signals over long distances.
- Utilizes phase shift and balanced modulation techniques to suppress one sideband and the carrier, improving bandwidth efficiency and signal-to-noise ratio, commonly used in amateur radio.

**Exercises/Projects:**

- An amplitude modulation (AM) signal has a carrier frequency of 1 MHz and is modulated by an audio signal with a frequency of 5 kHz. The carrier signal has an amplitude of 10 V, and the modulation signal has an amplitude of 2 V.
  - **Calculate the Modulation Index** of the AM signal.
  - **Determine the total power** of the AM signal.
  - **Sketch the frequency spectrum** of the AM wave, indicating the carrier frequency and sidebands.
  - Determine efficiency of Power amplifiers.

**Specific Resources: (web)**

<https://www.vedantu.com/physics/need-for-modulation>

**Unit - II**

Frequency Modulation-Theory of FM, mathematical representation of FM, frequency spectrum of FM wave, pre-emphasis and de-emphasis, narrow band FM, wide band FM, Generation of FM - Reactance Modulator.

**Examples/Applications/Case Studies:**

- FM Radio Broadcasting.
- Television Sound Transmission.

**Exercises/Projects:**

- Project 1: FM Transmitter and Receiver Kit
- Project 2: FM Noise Reduction System Using Pre-Emphasis and De-Emphasis

**Specific Resources: (web)**

([www.electronics-notes.com](http://www.electronics-notes.com))

**Unit - III**

Transmitters and Receivers - Block diagram of AM Radio transmitter, Block diagram of FM Radio transmitter and super heterodyne Receiver, FM-discriminators- balanced slope detector, phase discriminator & Ratio detector.

**Examples/Applications/Case Studies:**

- **Case Study 1:** AM Radio Transmitter and Superheterodyne Receiver for Local Radio Station
- **Case Study 2:** FM Radio Transmitter with Balanced Slope Detector

**Exercises/Projects:**

- **Project 1:** AM/FM Transmitter and Receiver System.
- **Project 2:** FM Receiver with Balanced Slope Detector.

**Specific Resources: (web)**

[https://www.cdt21.com/design\\_guide/superheterodyne-receivers/](https://www.cdt21.com/design_guide/superheterodyne-receivers/)

## Unit - IV

Communication bands- Electromagnetic spectrum, Pulse Modulation - Sampling Theorem, TDM, FDM, PAM- Generation & Detection PWM- Generation & Detection, PPM- Generation & Detection.

### Examples/Applications/Case Studies:

- **Example 1:** Digital Audio Transmission Using Pulse Modulation
- **Example 2:** Television Broadcasting Using Frequency Division Multiplexing (FDM)

### Exercises/Projects:

- Analyze and design a pulse modulation system for transmitting an audio signal.
- Design an FDM system for transmitting multiple signals and analyze its performance.

### Specific Resources: (web)

<https://telecom.economictimes.indiatimes.com/news/industry/understanding-spectrum-radio-frequency-optical-fiber-and-modulationtechniques/103349879>

## Unit - V

PCM – PCM encoders, decoders, Quantization noise, S/N ratio of PCM system, Advantages of digital over analog communications. Advantages of shift keying over digital communication, Types of shift keying, ASK – Generation & Detection, FSK – Generation & Detection, PSK – Generation & Detection.

### Examples/Applications/Case Studies:

- **Application 1:** Digital Telephony Using PCM.
- **Application 2:** Wireless Communication Using Shift Keying Techniques.

### Exercises/Projects:

- **Project 1:** PCM-Based Digital Audio Transmission System.
- **Project 2:** Design and Implementation of a Shift Keying Communication System.

### Specific Resources: (web)

<https://www.tapeheads.net/threads/pcm-decoder-an-application-for-windows.82905/>

### Text Books

1. George Kennedy,2005, Electronic Communication Systems, 4/e,McGraw Hill Book Company.
2. T.G. Palanivelu,2002, Communication Engineering,1/e,AnuradhaPublicatons.

### Reference Books

1. Roddy&Coolen,2005, Communication System, 4/e, Pearson Education.
2. Anok Singh,2004, Principles of Communication Engineering, 4/e, SathyaprakasamPublications.
3. Wayne Tomasi, 2004, Electronic Communication Systems, 4/e, Pearson Education.

MODEL PAPER

23ELMAL233: ELECTRONIC COMMUNICATION SYSTEMS

SECTION-A

Answer the following:

5x4=20M

1. a) Explain about need for modulation. **K2**  
(Or)  
b) Explain about power relations of AM. **K2**
2. a) Write short notes on wide band FM. **K2**  
(Or)  
b) Write short notes on pre-emphasis and de-emphasis. **K2**
3. a) Explain balanced slope detector. **K4**  
(Or)  
b) Draw the block diagram of AM radio transmitter. **K4**
4. a) Discuss briefly about TDM. **K4**  
(Or)  
b) Write short notes on communication bands. **K4**
5. a) Explain the generation and detection of FSK. **K4**  
(Or)  
b) Write a short note on amplitude shift keying. **K4**

SECTION-B

Answer the following:

5x10=50M

6. a) Define amplitude modulation and explain about frequency spectrum of AM wave. **K2**  
(Or)  
b) Explain about Suppression of one side band using phase shift method. **K2**
7. a) Define frequency modulation and explain about frequency spectrum of FM wave. **K2**  
(Or)  
b) Explain how FM signals are generated using reactance modulator. **K2**
8. a) Explain about the principle and working of super hetro dyne receiver. **K4**  
(Or)  
b) Discuss about the construction and working of Ratio detector. **K4**
9. a) Explain the block diagram of PAM and briefly explain each block. **K4**  
(Or)  
b) Describe the generation and detection of PPM. **K4**
10. a) Explain the block diagram of PCM in detail. **K4**  
(Or)  
b) Discuss briefly about Phase shift keying (PSK). **K4**