

Course Name : Electronics Engineering Group
Course Code : EJ/EX/ET/EN/IE
Semester : Fourth
Subject Title : Analog Communication
Subject Code : 174

Teaching and Examination Scheme:

Teaching Scheme			Examination Scheme					
TH	TU	PR	PAPER HRS	TH	PR	OR	TW	TOTAL
03	--	02	03	100	25#	--	25@	150

NOTE:

- **Two tests each of 25 marks to be conducted as per the schedule given by MSBTE.**
- **Total of tests marks for all theory subjects are to be converted out of 50 and to be entered in mark sheet under the head Sessional Work. (SW)**

Rationale:

Electronic Communication plays vital role in our lives. Development of communication Technology has increased its application in allied field of electronics including Telephony, telegraphy, satellite , Mobile, RADAR, industrial controls, online application like internet banking, ATM machine, Wireless network, optical communication, Mobile communication system.

Analog communication is a foundation for all advanced subjects in communication engineering. This subject will focus on the operation of analog transmission and reception techniques. This subject also deals with pulse modulation and their different types.

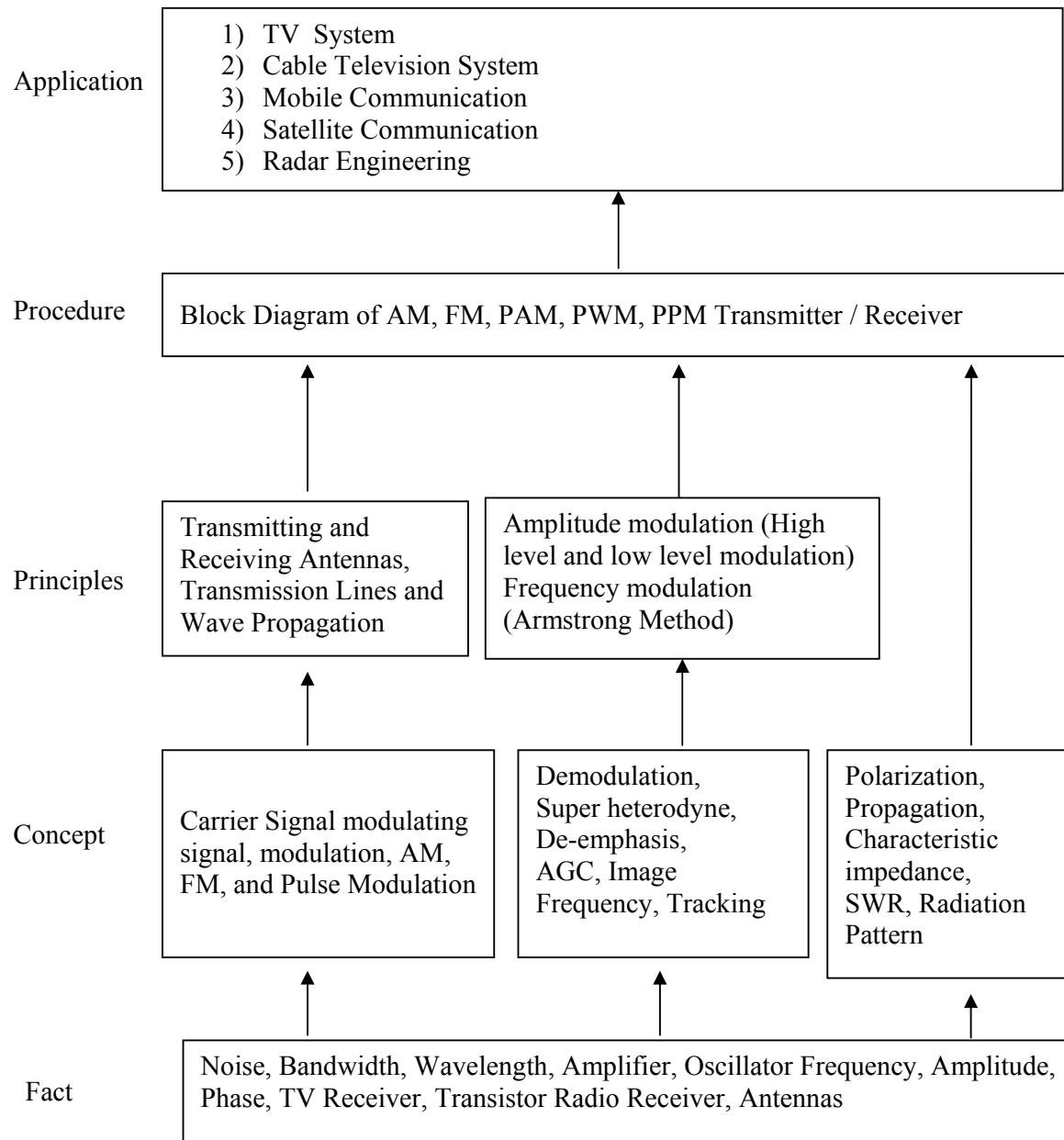
Study of Elements of Electronics, Electronic Devices and Circuits is prerequisite for Analog communication subject.

General Objectives:

The student will able to

1. Know different electronic communication systems.
2. Understand concept of modulation and demodulation of AM / FM.
3. Understand the operation of AM/ FM transmitter and receiver.
4. Understand the concept of radio wave propagation.

Learning Structure:



Theory Contents:

Topic No	Theory	Hrs.	Marks
1	<p>Basics of Electronic Communication.</p> <p>Specific Objectives: Student will be able to-</p> <ul style="list-style-type: none"> ➤ Draw block diagram of electronic communication system ➤ Identify types of electronic communication systems. ➤ Draw electromagnetic spectrum. <p>Contents:</p> <ul style="list-style-type: none"> • The importance of electronic communication. • Definition: Analog signal, Digital signal, Baseband signal • The elements of basic electronic communication system (Draw block diagram and explain each block.): • Noise in communication system and types • Types of electronic communication. Simplex, Duplex- full / half. • The electromagnetic spectrum. • Concept of transmission bandwidth. 	04	06
2	<p>Modulation Techniques</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State the importance of modulation. ➤ Explain the process of different modulation techniques. ➤ Compute the modulation index. ➤ Differentiate between CW and pulse modulation techniques. <p>Contents:</p> <p>2.1 Basics of Modulation [04]</p> <ul style="list-style-type: none"> • Need for modulation • Types: AM, FM, PM. Definition ,waveforms <p>2.2 Amplitude Modulation [06]</p> <ul style="list-style-type: none"> • Modulation index-definition, its effect on modulated signal, simple numerical. • Mathematical representation of amplitude modulated wave & its meaning., concepts of side band (SSB,DSB) • Bandwidth requirement • Block diagram of AM transmitter and its operation • Representation of AM signal in time & frequency domain • Power relations in AM wave, simple numerical • Circuit and operation of AM modulators using BJT/FET <p>2.3 Frequency modulation [08]</p> <ul style="list-style-type: none"> • Deviation ratio, maximum deviation ratio, mathematical representation of FM & its meaning • Representation of FM signal in time domain & frequency domain • Bandwidth requirements and simple numerical • Concept of Pre-emphasis & De-emphasis • Generation of FM -Reactance modulator, varactor diode modulator, Armstrong: circuit diagram and its working • FM signal generation using ICs 566,564 <p>2.4 Pulse Modulation Techniques. [06]</p>	12	24

	<ul style="list-style-type: none"> • Need of Pulse Modulation • PAM, PWM, PPM- Block diagram, waveforms, advantages & disadvantages & their comparison. • Generation of PAM transistorized circuit, Generation of PWM, PPM using IC 555. 		
3	<p>Radio Receiver Specific Objectives:</p> <ul style="list-style-type: none"> ➤ State super heterodyne principle ➤ Compare TRF & super heterodyne receivers. ➤ Explain the terms Automatic Frequency Control (AFC) and Automatic Gain Control (AGC). <p>Contents:</p> <p>3.1. Radio Receiver Types: [08]</p> <ul style="list-style-type: none"> • Block diagram of Tuned Radio Frequency receiver and its working with waveforms. • Block diagram of AM superheterodyne receiver and its working with waveforms. • RF Section and Characteristics of AM radio receiver Sensitivity, selectivity, fidelity. • Image frequency and its rejection, Double spotting • Frequency changing and tracking. <p>3.2. Demodulation of AM signal. [04]</p> <ul style="list-style-type: none"> • Diode detector, practical diode detector. • Need of AGC & its types – simple, delayed. <p>3.3 FM receiver : [06] Block diagram and explanation of FM Super heterodyne radio receiver with waveforms. Circuit diagram and working of limiter</p> <p>3.4 FM detector Types : [06]</p> <ul style="list-style-type: none"> • Balanced slope detector • Phase Discriminator • Ratio detector. • PLL as FM demodulator. 	14	24
4	<p>Topic.4 Transmission line Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Explain the theory of transmission line in general. ➤ Calculate characteristics impedance of transmission line. ➤ Define the terms standing wave, SWR, VSWR. ➤ Analyze the properties of impedance matching stubs. <p>Contents:</p> <p>4.1 Fundamentals of transmission line. [04]</p> <ul style="list-style-type: none"> • Equivalent circuit of transmission line (general, RF equivalents.) • Characteristics impedance and its method of calculation, simple Numerical. • Losses in transmission line. <p>4.2 Standing waves [08]</p> <ul style="list-style-type: none"> • With load terminals open circuited & short circuited • SWR, VSWR, Reflection coefficient, simple Numerical. • Quarter wave & half wave length line. • Impedance inversion by quarter wave length line. 	08	18

	<ul style="list-style-type: none"> • Quarter wave transformer & impedance matching • Properties of line of various lengths. <p>4.3 Impedance Matching [06]</p> <ul style="list-style-type: none"> • Stub: single & double. • Baluns 		
5	<p>Wave Propagation</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Explain the theory of electromagnetic radiation. ➤ State different types of wave propagation. ➤ Define the various atmospheric layers ➤ Define the terms maximum usable frequency, critical frequency, skip distance & fading. <p>Contents:</p> <p>5.1 Fundamental of electromagnetic waves , Transverse electromagnetic wave, polarization [04]</p> <p>5.2 Types of Wave Propagation [08]</p> <ul style="list-style-type: none"> • Ground Wave. • Sky wave, ionosphere & its effect. • Space Wave , Duct propagation • Troposphere scatter propagation • Concept of actual height & virtual weight • Critical frequency, skip distance & fading, maximum usable frequency. 	04	12
6	<p>Antennas.</p> <p>Specific Objectives:</p> <ul style="list-style-type: none"> ➤ Define antenna. ➤ Define the term related with the antenna. ➤ Draw the structure, radiation pattern of antennas. ➤ State application of different antennas. <p>Contents:</p> <p>6.1 Antenna fundamentals : [04]</p> <ul style="list-style-type: none"> • Resonant antenna and Non-resonant antennas • Definition : Radiation pattern ,polarization, bandwidth, beam width, antenna resistance, directivity & power gain, antenna gain <p>6.2 Dipole antenna [04]</p> <ul style="list-style-type: none"> • Half wave dipole antenna (Resonant Antenna) & its Radiation pattern. • Folded dipole antenna & its radiation pattern. • Radiation pattern for Dipole Antenna of different length. <p>6.3 Structure, radiation pattern & application of antennas. [08]</p> <ul style="list-style-type: none"> • Loop antenna. • Telescopic antenna. • Yagi-Uda antenna • Micro wave antenna – Dish antenna &Horn antenna • Microstrip patch antennae- Rectangular, square and circular 	06	16
Total		48	100

Practical:**Intellectual Skills:**

1. Interpret the output results

Motor Skills:

1. Testing and observing the waveforms at various stages
2. Fault finding
3. Measurement of different parameters like sensitivity, selectivity, fidelity
4. Small circuit development

List of Practical's

1. Observe and draw the waveform of AM & calculate modulation index of AM
2. Observe and draw input/output waveforms of AM detector.
3. Observe and draw the waveform of FM & calculate modulation index of FM
4. Observe and draw the waveforms of FM modulator using IC 566.
5. Observe and draw the waveforms of FM demodulator using IC 564.
6. Observe the wave forms at various points in AM receiver. Trouble shooting and fault finding in AM receiver.
7. Observe & Plot the graph of RF Characteristics of Radio Receiver: Selectivity, Sensitivity, Fidelity
8. Generate PAM and observe the waveforms of PAM
9. Generate PWM, PPM and observe the waveforms of PWM, PPM using IC's.
10. Plot the radiation pattern of Dipole & Yagi-Uda antenna.
11. Measure the characteristic impedance of co-axial cable Find the impedance and VSWR.
12. Visit to the radio transmitter station and write a transmitter specification.

Learning Resources:**1. Books:**

Sr. No.	Author	Title	Publisher
01	George Kennedy, Bernard Davis, SRM Prasanna	Electronic Communication Systems	TATA Mc-Graw Hill 5 th Edition
02	Louis E Frenzel	Communication Electronics	TATA Mc-Graw Hill 5 th Edition
03	V Chandra Sekar	Analog Communication	Oxford University Press
04	Roddy Collen	Electronic Communication	Prentice Hall India
05	Wayne Tomasi	Electronic Communication Systems	Pearson

2. Websites:

- 1) en.wikipedia.org
- 2) www.masd.k12.pa.us (Electromagnetic Spectrum)
- 3) www.staff.ncl.ac.uk (modulation & demodulation)
- 4) circuitdiagram.net/am-radio-receiver.html (AM radio receiver circuit diagram)
- 5) <http://www.circuitdiagram.org/am-radio-receiver-with-mk484.html>
- 6) www.circuitstoday.com/single-chip-fm-radio-circuit

List of equipments:

1. CRO, Function generator, spectrum analyzer, DMM
2. AM,FM,PAM,PWM,PPM Modulation/ Demodulation trainer kits
3. Transmission line trainer kit/ Coaxial cable e.g. (RG174) -100mtrs.
4. Antenna demonstration kit/ Antenna for measuring its parameters