

16EC208 ANALOG COMMUNICATIONS

Hours Per Week :

L	T	P	C
3	-	2	4

Course Description and Objectives:

This course deals with the fundamentals of analog communications - amplitude modulation and demodulation, frequency modulation and demodulation, phase modulation and demodulation. The objective of this course is to enable the students to understand the basic mathematical concepts of communications in both time domain and frequency domain.

Course Outcomes:

Upon successful completion of this course, students should be able to:

- CO1: Understand the concepts of modulation, demodulation and learn the basic amplitude modulation techniques.
- CO2: Analysis of DSB-SC, SSB-SC and VSB-SC modulation and demodulation techniques.
- CO3: Analyze the performance of different types of Angle Modulation Techniques for a given set of parameters.
- CO4: Identify the transmitter and receiver types required for a given application.
- CO5: Understand the calculation of SNR in different modulation techniques.
- CO6: Experiment on different types of Analog communication subsystems using hardware and simulations.

SKILLS:

- ✓ *Identify the need for modulation and choice of modulation.*
- ✓ *Choose the choice of frequency bands of AM/FM/T.V/Mobile/Satellite.*
- ✓ *Select base band signal, carrier and modulated signals in a given application.*
- ✓ *Determine the frequency deviation/guard band for FM receiver.*
- ✓ *Identify the Tx/Rx type required for a given application.*
- ✓ *Select the detector/discriminator required in FM.*
- ✓ *Identify inherent or interference noise and classify.*

UNIT - 1**L-9**

INTRODUCTION TO COMMUNICATION SYSTEM: Introduction to communication system, Need for modulation, Frequency division multiplexing, Amplitude modulation- Definition, Time domain and frequency domain description, Single tone modulation, Power relations in AM waves; Generation of AM waves - Square law modulator, Switching modulator; Detection of AM waves- Square law detector, Envelope detector.

UNIT - 2**L-10**

DSB-SC, SSB-SC AND VSB-SC MODULATION AND DETECTION: DSBSC modulation, Time domain and frequency domain description, Generation of DSBSC waves - Balanced modulators, Ring modulator; Detection of DSBSC waves - Coherent detection, COSTAS loop; SSB modulation, Time domain description, Frequency domain description, Generation of SSB Waves -Frequency discrimination method, Phase discrimination method; Demodulation of SSB Waves, VSB modulation, Frequency description, Time domain description, Generation of VSB modulated wave, Envelope detection of a VSB wave plus carrier, Comparison of AM techniques, Applications of different AM systems.

UNIT - 3**L-10**

ANGLE MODULATION SYSTEMS: Angle modulation - Phase and frequency modulation and their relationships, Phase and frequency deviation, Spectrum envelope of FM signal, Narrow band FM and wide band FM, Transmission bandwidth; Generations of FM waves, Indirect and direct methods, Detection of FM waves - Balanced frequency discriminator, Foster seely discriminator, PLL demodulator.

UNIT - 4**L-8**

RADIO TRANSMITTERS AND RECEIVERS: Radio transmitters - Classification of radio transmitters, AM transmitters and FM transmitters, Variable reactance type and phase modulated type; Radio receivers - Radio receiver types, TRF receiver, Super heterodyne receivers, FM receivers; Comparison of AM and FM receivers.

UNIT - 5**L-8**

NOISE: Noise in analog communication system, Noise in DSB and SSB system, Noise in AM system, Noise in angle modulation system, Threshold effect in angle modulation system, Pre-emphasis and de-emphasis.

ACTIVITIES:

- Choose the modulation scheme for the given Audio signal with minimum bandwidth.
- Choose the modulation scheme for the given voice signal with very good quality.
- Design simple AM modulator using discrete components.
- Design a VCO (NE 566) to generate FM signal for a given application.
- Design the scheme for demonstrating the capturing effect of FM receiver.

LABORATORY EXPERIMENTS**LIST OF EXPERIMENTS**

Total hours-30

1. Amplitude Modulation and Demodulation.*
2. DSB-SC Modulation and Demodulation.*
3. SSB-SC Modulation and Demodulation.*
4. Frequency Modulation and Demodulation.
5. Pre-Emphasis and De-Emphasis.
6. Verification of Sampling Theorem.
7. Phase Locked Loop.
8. Design of Mixer.
9. AGC Characteristics.
10. Frequency Division Multiplexing.

* To be performed both in hardware and software (Simulink).

TEXT BOOKS:

1. H Taub, D.L. Schilling and Goutam Saha, "Principles of Communication Systems", 3rd edition, TMH, 2008.
2. G.K. Mithal, "Radio Engineering Principles of Communication systems", 20th edition, Khanna Publishers, 2008.

REFERENCE BOOKS:

1. B.P.Lathi, "Modern Digital and Analog Communication Systems", 3rd edition, Oxford University Press, 2007.
2. B.Sklar, "Digital Communications Fundamentals and Applications", 2nd edition, Pearson Education, 2007.
3. H P Hsu, "Analog and Digital Communications", Schaum Outline Series, TMH, 2006.
4. Leon W. Couch, "Digital and Analog Communication Systems", 8th edition, Pearson, 2013.