

ANALOG COMMUNICATIONS

II B-Tech –II Semester

L T P C

Course Code: A3EC10

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Course Overview:

This course starts by introducing study about the communication system and need of modulation. This course describes the Amplitude Modulation and types of AM(DSB-SC,SSB&VSB) with time domain and frequency domain. This course provides an introduction to Angle Modulation emphasis on Frequency Modulation (FM) and its applications in various forms. This course aims at developing statistical techniques needed to evaluate the performance of Analog Communication systems in the presence of noise. Finally, this course focuses on the design of Analog Communication systems for a given channel and Pulse Modulation techniques.

Course Objectives:

1. To introduce the communication system and need of modulation.
2. To explain the concepts of Amplitude Modulation and its types (DSB-SC, SSB and VSB).
3. To explain the concepts of Angular Modulation, FM and types of FM
4. To describe the behaviour of analog communications in the presence of noise and also the basics of analog pulse modulation techniques
5. To classify and discuss the different types of transmitters and receivers

Course Outcomes:

After going through this course the student will be able to

- Discuss about the basic elements of communication system, importance of modulation and different types of modulation.
- Analyze the time domain, frequency domain description of Double Side Band Suppressed Carrier (DSB SC), various generation techniques and detection techniques of DSB SC, Noise in DSB SC
- Analyze the basic concepts of Frequency modulation like single tone , spectrum analysis of frequency modulated wave and transmission bandwidth of FM.
- Knowledge of analog pulse modulation techniques is obtained
- Discuss the concept of receivers in communication system and receiver types like tuned radio frequency receiver and super heterodyne receiver.

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SYLLABUS

UNIT-I

Amplitude Modulation: 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, Envelop detector, Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSB-SC Modulated waves, COSTAS Loop.

UNIT-II

SSB Modulation: Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelop detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

UNIT-III

Angle Modulation: Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of FM and AM.

UNIT-IV

Noise in Analog Communication System: Types of Noise: Resistive (Thermal) Noise Source, Shot noise, Extraterrestrial Noise, Arbitrary Noise Sources, White Noise, Narrowband Noise- In phase and quadrature phase components and its Properties, Modeling of Noise Sources, Average Noise Bandwidth, Effective Noise Temperature, Average Noise Figures, Average Noise Figure of cascaded networks. Noise in DSB and SSB System Noise in AM System, Noise in Angle Modulation System, Noise Triangle in Angle Modulation System, Pre-emphasis and de-emphasis.

UNIT-V

Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Pulse Modulation: Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation and demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing.

TEXT BOOKS:

1. Simon Haykin (1994), *Communication Systems*, 2nd edition, Wiley Eastern, India.
2. Taub and schilling (2015), *Principles of Communication Systems*, Tata McGraw Hill, India.

REFERENCE BOOKS:

1. Kennedy (2005), Davis, *Electronic Communication Systems*, 4th Edition, Tata McGraw Hill, New Delhi.
2. B. P. Lathi (1998), *Modern Digital and Analog Communication Systems*, 3rd edition, BPB Publication, New Delhi..