

Semester	IV	Course Title	Analog Communication	Course Code	18 EC 45
Teaching Period	50 Hours	L – T – P – TL*	3 – 1 – 0 – 4	Credits	4
CIE*	40 Marks	SEE*	60 Marks	Total	100 Marks

CREDITS – 04

Course objectives: This course will enable students to:

- Design simple systems for generating and demodulating AM, DSB, SSB and VSB signals.
- Understand the concepts in Angle modulation for the design of communication systems.
- Design simple systems for generating and demodulating frequency modulated signals.
- Learn the concepts of random process and various types of noise.
- Evaluate the performance of the communication system in presence of noise. Analyze pulse modulation and sampling techniques.

Module – 1

AMPLITUDE MODULATION: Introduction, Amplitude Modulation: Time & Frequency – Domain description, Switching modulator, Envelop detector.

DOUBLE SIDE BAND-SUPPRESSED CARRIER MODULATION: Time and Frequency – Domain description, Ring modulator, Coherent detection, Costas Receiver, Quadrature Carrier Multiplexing.

SINGLE SIDE-BAND AND VESTIGIAL SIDEBAND METHODS OF MODULATION: SSB

Modulation, VSB Modulation, Frequency Translation, Frequency- Division Multiplexing, Theme Example: VSB Transmission of Analog and Digital Television. (Chapter 3 of Text). **L1, L2, L3**

Module – 2

ANGLE MODULATION: Basic definitions, Frequency Modulation: Narrow Band FM, Wide Band FM, Transmission bandwidth of FM Signals, Generation of FM Signals, Demodulation of FM Signals, FM Stereo Multiplexing, Phase-Locked Loop: Nonlinear model of PLL, Linear model of PLL, Nonlinear Effects in FM Systems. The Super heterodyne Receiver (refer Chapter 4 of Text). **L1, L2, L3**

Module – 3

RANDOM VARIABLES & PROCESS: Introduction, Probability, Conditional Probability, Random variable Several Random Variables. Statistical Averages: Function of a random variable, Moments, Random Processes, Mean, Correlation and Covariance function: Properties of autocorrelation function, Cross correlation functions (refer Chapter 5 of Text).

NOISE: Shot Noise, Thermal noise, White Noise, Noise Equivalent Bandwidth (refer Chapter 5 of Text), Noise Figure (refer Section 6.7 of Text). **L1, L2, L3**

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Module – 4

NOISE IN ANALOG MODULATION: Introduction, Receiver Model, Noise in DSB-SC receivers, Noise in AM receivers, Threshold effect, Noise in FM receivers, Capture effect, FM threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM (refer Chapter 6 of Text). **L1, L2, L3**

Module – 5

DIGITAL REPRESENTATION OF ANALOG SIGNALS: Introduction, Why Digitize Analog Sources?, The Sampling process, Pulse Amplitude Modulation, Time Division Multiplexing, Pulse-Position Modulation, Generation of PPM Waves, Detection of PPM Waves, The Quantization Process, Quantization Noise, Pulse-Code Modulation: Sampling, Quantization, Encoding, Regeneration, Decoding, Filtering, Multiplexing (refer Chapter 7 of Text), Application to Vocoder (refer Section 6.8 of Reference Book 1).

L1, L2, L3

Course Outcomes: At the end of the course, students will be able to:

- **Explain** the process of generation and detection of AM, DSBSC, SSBSC and VSBSC.
- **Describe** the principles of angle modulation for generating and demodulating FM signals.
- **Outline** the noise types in Communication systems and characteristics of analog signals as applied to random process.
- **Develop** the expressions of Figure of merit for AM and FM in communication systems.
- **Discuss** the concepts of Digital representation of analog systems.

Text Book:

- **Communication Systems**, Simon Haykins & Moher, 5th Edition, John Wiley, India Pvt. Ltd, 2010, ISBN 978 – 81 – 265 – 2151 – 7.

Reference Books:

- **Modern Digital and Analog Communication Systems**, B. P. Lathi, Oxford University Press., 4th edition.
- **An Introduction to Analog and Digital Communication**, Simon Haykins, John Wiley India Pvt. Ltd., 2008, ISBN 978–81–265–3653–5.
- **Principles of Communication Systems**, H.Taub & D.L.Schilling, TMH, 2011.
- **Communication Systems**, Harold P.E, Stern Samy and A.Mahmond, Pearson Edition, 2004.
- **Communication Systems: Analog and Digital**, R.P.Singh and S.Sapre: TMH 2nd edition, 2007.