EC-210 **ANALOG COMMUNICATION** **L T P C**
4 1 - 3

COURSE OBJECTIVES:

1. To understand the various amplitude modulation and demodulation techniques & systems.
2. To understand the complex low pass representations, SSB and VSB modulations.
3. To understand the angle modulation and demodulation techniques.
4. To understand the functions of AM and FM transmitters and receivers.
5. To understand the effect of noise on the performance of AM and FM receivers and the principles of PAM, PWM, and PPM, TDM, and FDM techniques.

COURSE OUTCOMES:

After successful completion of the course, the students are able to

1. understand basic Elements of communication systems such as amplitude, frequency, and Phase modulations & demodulations, Radio transmission & reception and noise.
2. analyze noise performance in modulation systems, calculation of total power and bandwidth.
3. maintain standards while designing radio transmitters and receivers.
4. solve problems pertaining to modulation schemes, transmitters and receivers considering noise effects.
5. Apply appropriate techniques for modulation schemes understanding power and bandwidth limitations.

UNIT I *Text Book - 1* **(12)**

AMPLITUDE MODULATION : Time domain description, Frequency domain description, Single tone modulation, Power Relations in AM Waves, Generation of AM wave, Square law modulator, Switching Modulator, Detection of AM waves, Square law detector, Envelope detector, DSB-SC Modulation, Time-domain and frequency domain descriptions of DSB-SC, Generation of DSB-SC: Balanced modulator, Ring modulator, Coherent detection of DSB-SC modulated waves, Costas loop, Quadrature-Carrier multiplexing.

UNIT II *Text Book - 1* **(14)**

SSB & VSB MODULATION : Band-pass transmission, Complex low-pass representation of Narrow-band signals, Concepts of pre-envelope, Complex envelope and Natural envelope, Equivalent low-pass transmission model, Single side band modulation: Frequency domain description, Generation of SSB-SC wave, Frequency-discrimination method, Phase discrimination method, Demodulation of SSB-SC waves, Vestigial side-band modulation, Frequency domain description, Generation of VSB modulated wave, Envelope detection of VSB wave plus carrier, comparison of modulation techniques.

UNIT III *Text Book - 1* **(12)**

ANGLE MODULATION : Introduction to Angle modulation, Relation between frequency Modulation and phase modulation, Single tone frequency modulation, Spectrum analysis of sinusoidal FM wave, Narrow Band FM and Wide Band FM, Transmission bandwidth of FM waves, Carson's Rule, Generation of FM waves, Indirect FM (Armstrong Method), Direct FM, Demodulation of FM waves, Balanced frequency discriminator - Zero-crossing detector.

UNIT IV *Text Book - 2* **(12)**

RADIO TRANSMITTERS & RECEIVERS : Frequency allocation for radio communication systems, Block diagrams and functions of radio transmitters for AM and FM systems ,TRF and super heterodyne receivers, RF, Mixer and IF stages, Choice of IF, Image frequency, Alignment and tracking of radio receivers, AGC, Tone and volume controls, Receiver characteristics and their measurements, FM

receivers, Communication receivers.

UNIT V *Text Book - 1* **(13)**

DISCRETE MODULATION & NOISE IN ANALOG MODULATION : Practical aspects of sampling, Generation and Demodulation of PAM, PWM and PPM, TDM, FDM,AM Receiver model, Signal to noise ratios for coherent reception. DSB-SC receiver, SSC-SC receiver, Noise in AM receivers using envelope detection. AM threshold effect, FM receiver model, Noise in FM reception, Capture effect in FM, Threshold effect, FM threshold reduction, Pre-emphasis and De-emphasis in FM.

LEARNING RESOURCES:

TEXT BOOK(s):

1. Simon Haykin - Introduction to Analog and Digital Communication Systems, 3rd Edition, John Wiley and Sons, 2001.
2. George Kennedy - Communication Systems, 3rd Edition, TMH Publishing.

REFERENCE BOOK(s):

1. Haykin Moher - Introduction to Analog and Digital Communications, 2nd Edition, Wiley,2014.
2. Sam Shanmugam - Analog and Digital Communication Systems, John Wiley, 1992.
3. B.P.Lathi - Communication Systems, BS Publications, 2006.

WEB RESOURCES:

1. http://web.engr.oregonstate.edu/~magana/ECE461-561/index.htm.
2. http://www.ensc.sfu.ca/~jiel/courses/327/index.html.