EC302	Analog and Digital Communications	PCC	3-0-0	3 Credits

Pre-requisites: EC202-Signals and Systems

Course Outcomes: After the completion of the course the student will be able to:

CO1	Compare the performance of AM, FM schemes
CO2	Model a Digital Communication System
CO3	Convert Analog signal to Digital Signal
CO4	Compare different digital modulation schemes.

Mapping of course outcomes with program outcomes:

CO \ PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	-	-	2	-	-	-	-	-	-	-	2	-
CO2	-	-	-	-	2	-	-	-	-	-	-	-	2	2
CO3	-	1	-	-	3	-	-	-	-	-	-	-	2	-
CO4	-	1	-	-	3	-	-	-	-	-	-	1	2	-

Detailed Syllabus:

INTRODUCTION: Introduction to communication system, Communication Channels, Need for modulation, Analog vs Digital, Review of Signals and Systems.

AMPLITUDE MODULATION: Definition, Time domain and frequency domain description - AM, DSB-SC, single tone modulation, power relations in AM waves, Generation of AM waves (square law, Switching), Envelop detector, Generation of DSBSC Waves (Balanced, Ring), Coherent detection of DSB-SC Modulated waves, COSTAS Loop.

SSB MODULATION: Time domain, Frequency domain description, Frequency discrimination, Demodulation of SSB Waves, Frequency Division Multiplexing, Vestigial side band modulation- Time domain, Frequency description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.

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 and Demodulation of FM Waves; Comparison of FM and AM, Super heterodyne Receiver.

PULSE MODULATION TECHNIQUES: Pulse Analog and Pulse Digital Modulation Schemes–Pulse Amplitude Modulation, Pulse width modulation, PPM, TDM, Pulse Code Modulation, Differential PCM systems (DPCM), Delta modulation, adaptive Delta modulation, comparison of PCM and DM systems, noise in PCM and DM systems.

DETECTION AND ESTIMATION: Model of Digital Communication Systems, Gram-Schmidt Orthogonalization, Geometric interpretation of signals, detection of known signals in noise, probability of error, matched filter receiver, correlation receiver

BASE BAND SHAPING FOR DATA TRANSMISSION: Requirements of a line encoding format, various line encoding formats- Unipolar, Polar, Bipolar, Discrete PAM signals, Inter symbol interference, Nyquist's criterion, Raised cosine filter, Eye pattern.

DIGITAL MODULATION TECHNIQUES: Digital Modulation formats, Coherent binary modulation techniques (BPSK, BFSK), Coherent quadrature modulation techniques (QPSK), Non-Coherent binary modulation techniques (DPSK), QAM, M-ary modulation techniques (PSK, FSK, QAM), Comparison of M-ary digital modulation techniques, power spectra, bandwidth efficiency; BER for BPSK

Reading:

1. S. Haykin,"Communication Systems", John Wiley and Sons, 2001
2. B.P. Lathi, "Modern Digital & Analog Communications Systems", Oxford University Press
3. J. G. Proakis, M. Salehi, "Communication Systems Engineering", Pearson Education, 2002
4. H. Taub, D.L. Schilling, "Principles of Communication Systems", Tata McGraw Hill, 2001
5. Behrouz A. Forouzan, "Data communication and Networking", Tata McGraw Hill, 2007
6. Leon W.Couch II., Digital and Analog Communication Systems, 6th Edition, Pearson Education Inc., New Delhi, 2001.
7. A Bruce Carlson, PB Crilly, JC Rutledge, Communication Systems, 4th Edition, McGraw Hill New York, 2002.