Analog and Digital Communication: EC 604 EC/ECC
B. E. III (Electronics & Telecommunication Engg.) 6th Sem.

	Lecture	Tutorial	Practical
Teaching Hours	3	1	2
Examination Scheme Marks	100	25	Cont. Evaluation :20 Examination : 30

Faculty for Analog Communication: Prof. Maulin M Joshi
Faculty for Digital Communication: Prof. Mehul S Raval

Sr.No.	Topics	Text Book	Ref. Book
SECTION – I Analog Communication			
1.	**Introduction:** Introduction to basic communication systems, Sources of Information, Communication Channels, Classification of communication, Advantages ,disadvantages and limitations, Various frequency bands(Electromagnetic spectrum) assigned by CCIR and ITU.	[1] Chapter 1	[2][3]
	Signals and Systems: Signals and Signal Classifications, Frequency domain analysis, Continuous time Periodic Signals and Fourier Series: Trigonometric and exponential, Continuous time aperiodic signals and Fourier Transform, Properties, Fourier transform of periodic signals, Convolution, Auto and Cross correlation, Energy Spectral Density and Power Spectral Density, Impulse response of LTI systems.	[1] Chapter 2	[2][3]
2.	**Amplitude Modulation:** The modulation process, Base band and band pass signals, AM, Equation for AM, modulation index, spectrum of AM, Single tone and Multitone AM, Power Content **in Single tone and multi tone**, Transmission Efficiency, Generation of AM, Collector modulation method, Demodulation: Envelope detector and square law detector, Diagonal peak clipping and negative peak clipping in envelope detector, Modulation index measurement using trapezoidal method on CRO. DSBSC Generation and demodulation, **QAM**, SSBSC generation and demodulation, VSB generation and demodulation, Comparisons	[1] Chapter 3	[2][3]
	AM receivers: TRF and Super heterodyne Receivers, Sensitivity and selectivity, Principle of Automatic Gain Control (AGC).	[1] Chapter 7	
	Noise in DSBFC, DSBSC and SSBSC systems.	[1] Chapter 8	
3.	**Angle modulation: Concept**, Basic definition, Frequency and phase deviation, Equations for FM and PM, **Relationship between FM and PM**, modulation index, Relationship between FM and PM, phasor representation, spectrum calculation for sinusoidal waveform and Bessel's function table, Bandwidth requirements, Power calculations, NBFM and WBFM, **Effect of varying Modulation index on FM, transmission B/w in FM**, Multiple frequency and square wave modulation, Comparison between AM and angle modulation, Direct FM modulators: Varactor diode and JFET reactance modulator, FM Transmitters, Angle modulation detectors: Slope, Foster Seeley and Ratio detectors, PLL detectors, Pre emphasis/ De emphasis network, Automatic Frequency control and amplitude limiters, FM receivers, Noise in angle modulated systems.	[1] Chapter 4	[2][3]

[1] Sanjay Sharma, "Communication Systems (Analog and Digital)" 3rd Edition, S.K.kataria and Sons, 2005
[2]B.P.Lathi "Modern Digital and Analog Communication systems", Oxford press, 3rd Edition
[3] Wayne Tomasi "Electronic Communication systems Fundamentals Through Advance", PEA, Indian reprint 2002

	SECTION – II Digital Communication		
4	**Pulse Modulation and Sampling:** Sampling theorem and its proof, Nyquist's rate and Nyquist's criteria, Reconstruction filter, aliasing, Sampling techniques and comparisons, Aperture effect, Analog pulse modulation methods, PAM, PPM, PWM, PTM, Comparison of PAM, PPM and PWM, and Advantages and disadvantages. Process of A/D conversion and PCM, PCM transmitter and receiver, types of quantizer- uniform and non uniform, Quantization noise, transmission bandwidth in PCM, effect of noise in PCM, Companded PCM, compander characteristics-U law and A law, application, advantages and disadvantages of PCM, DM, ADM, DPCM, comparison of all methods.	1 Chap: 9 and 10	3,4
5	**Digital Modulation Techniques:** Digital Radio, digital Amplitude modulation, FSK, PSK-BPSK and QPSK, QAM- 8 QAM and 16 QAM, Bandwidth efficiency, carrier recovery, DPSK, probability of error and bit error rate.	1 Chap: 13	3,4
6	**Digital Base band Transmission:** Line encoding methods : NRZ, RZ, Manchester, and multilevel encoding methods and comparison of these schemes	2 Chap:4	1 Chap:12 4
7	**Information Theory & source coding:** Information source, measure of information, entropy, information rate, discrete memory less source, types of channels, condition joint entropy mutual information, channel capacity and Shannon's theorem. Source coding- code length and code efficiency, Huffman coding.	1 Chap 14	3,4
8	**Multiplexing:** TDM systems, T1 digital carrier systems, FDM and its example.	1 Chap:11	3,4

References for Digital communication:

[1] Sanjay Sharma, "Communication Systems (Analog and Digital)" 3rd Edition, S.K.kataria and Sons, 2005.

[2]Behrouz Forouzan: Data Communication and Computer networking 3ed, Tata McGraw Hill Publication,2004.

[3]Bernard Sklar, "Digital Communications Fundamentals and Applications", 2/e, Pearson Education Asia (LPE), Third Indian Reprint 2002

[4] Amitabha Bhattacharya, "Digital Communication", Tata Mcgraw hill, 2006