Maulana Abul Kalam Azad University of Technology, West Bengal
Syllabus for B. Tech in Electronics & Communication Engineering
(Applicable from the academic session 2018-2019)

Semester-IV

EC401	Analog Communication	3L:0T:0P	3 credits

Mod-1   Introduction to Analog Communication: **8L**
Elements of communication system - Transmitters, Transmission channels & receivers (1), Concept of modulation, its needs (1).

Continuous Wave Linear Modulation:
a) Amplitude modulation(AM-DSB/TC): Time domain representation of AM signal (expression derived using a single tone message), modulation index , frequency domain (spectral) representations, illustration of the carrier and side band components; transmission bandwidth for AM; Phasor diagram of an AM signal; Calculation of Transmitted power & sideband power & Efficiency ; concept of under, over and critical modulation of AM-DSB-TC.
b) Other Amplitude Modulations: Double side band suppressed carrier (DSBSC) modulation: time and frequency domain expressions, bandwidth and transmission power for DSB. Single side band modulation (SSB) both TC & SC and only the basic concept of VSB, Spectra and band-width.

Mod-2   Generation & Detection of Amplitude Modulation: **8L**
a) Generation of AM: Concept of i) Gated and ii) Square law modulators, Balanced Modulator.
b) Generation of SSB: Filter method, Phase shift method and the Third method
Demodulation for Linear Modulation:
Demodulation of AM signals: Detection of AM by envelope detector , Synchronous detection for AM-SC, Effects of Frequency & Phase mismatch, Corrections. Principle of Super heterodyne receivers: Super heterodyning principle, intermediate frequency, Local oscillator frequency, image frequency.

Mod-3   Angle Modulation: **8L**
a) Frequency Modulation (FM) and Phase Modulation (PM): Time and Frequency domain representations, Spectral representation of FM and PM for a single tone message, Bessel's functions and Fourier series. ; Phasor diagram ;
b) Generation of FM & PM: Narrow and Wide-band angle modulation, Basic block diagram representation of generation of FM & PM, Concept of VCO & Reactance modulator
c)   Demodulation of FM and PM: Concept of frequency discriminators , Phase Locked Loop

Mod - 4 Multiplexing   **8L**

a) Frequency Division Multiplexing, Time Division Multiplexing, (FDM)
b) Stereo - AM and FM: Basic concepts with block diagrams
c) Random Signals and Noise in Communication System:

i) Noise in Communication systems - Internal & External noise, Noise Temperature, Signal-to-Noise ratio, White noise, thermal noise, Figure of Merit.

ii)Noise performance in Analog Communication systems: SNR calculation for DSB/TC, DSB-SC, SSB-TC, SSB-SC & FM

d) Conditional probability, communication example, joint probability, statistical independence, random variable-continuous and discrete, cumulative distribution function, probability density function – Gaussian, Rayleigh and Rician.

Text Books:

7. Taub and Schilling , "Principles of Communication Systems", 2nd ed., Mc-Graw Hill
8. B.P.Lathi -Communication Systems- BS Publications
9. V Chandra Sekar - Analog Communication- Oxford University Press

References:

1. Carlson—Communication System,4/e , Mc-Graw Hill
2. Proakis & Salehi Fundamentals of Communication Systems- Pearson
3. Singh & Sapre—Communication Systems: 2/e, TMH
4. P K Ghosh- Principles of Electrical Communications- University Press
5. L.W.Couch Ii, "Digital and Analog Communication Systems", 2$^{/}$e, Macmillan Publishing
6. Blake, Electronic Communication Systems- Cengage Learning
7. S Sharma, Analog Communication Systems- Katson Books

Learning outcome:

Module - 1: The learner must be able to appreciate the need for modulation and calculate the antenna size for different carrier frequencies.
From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted. Solve problems.

Module - 2: After understanding the basic concepts the learner must be able to compare between the different demodulation methods, design an envelope detector, calculate the IF and image frequencies for the superheterdyne receivers given the carrier and modulating frequencies, calculate the oscillator frequency.

Module - 3: From the functional representation of the modulated carrier wave, the learner must be able to identify the type of modulation, calculate the side-band frequencies, identify the modulating and carrier frequencies, decide the type of generation method to be adopted. Solve problems.

Module - 4: Appreciate the importance of Multiplexing, find out their application areas. The learner must be able to calculate the Noise temperature & SNR for different systems, also compare between the performance of the different modulation methods by comparing their SNR. Also Understand the statistical analysis of Communication Sysytem.