5th Semester	REE5D002	Fundamentals of Communication Theory	L-T-P 3-0-0	3 Credits

Fundamentals of Communication Theory

Module-I: **(12 Hours)**

Introduction to basic elements of communication systems. Signal transmission through linear systems: condition for distortion less transmission of signals through networks. Different types of distortion and their effect on the quality of output signals, transmission of transient signals, distortion analysis.

Amplitude modulation: Modulation principle and definitions, sideband and carrier power, generation of AM signal, demodulation of AM signal. Different type of modulator circuits, square law modulator, balanced modulator. Demodulator basic principle of coherent detections, square law detectors, average envelope and peak envelope detectors. Quadrature amplitude modulation (QAM), amplitude modulation: single sideband (SSB), generation of SSB signals, selective filtering method, phase shift method, demodulation of SSB-SC signals, envelop detection of SSB signals with a carrier (SSB+C), amplitude modulation: vestigial sideband (VSB), envelop detection of VSB+C signals, noise in AM receivers using envelope detection, concept of SNR.

Module-II: **(10 Hours)**

Frequency and phase modulation: Principles and definitions, relationship between frequency and phase modulations. phase and frequency deviations, spectrum of FM signal, bandwidth considerations. Effect of modulation index on bandwidth, narrow band and sideband FM and PM principles, circuit for realization of FM and PM. Demodulation: Principle of demodulation: different type of demodulator, discriminator, use of PLL etc.

Module-III: **(10 Hours)**

Radio transmitter: Basic block diagram of radio transmitter (AM and FM), Analysis of a practical circuit diagram used for medium power transmitter.

Radio receiver: Basic block diagram of TRF, Superheterodyne principle, its advantages, Mixer principle and circuit, AVC, Radio receiver measurement.

System noise calculation: Signal to noise ratio of SSB, DSB, AM for coherent and envelope and square law detection, threshold effect. Signal to noise calculation for FM and threshold.

Books:
[1]   S Haykin, "Communications Systems", John Wiley and Sons, 2001.
[2]   B. P. Lathi, "Modern Digital and Analog Communication Systems", Oxford
[3]   R. P. Singh, S. D. Sapre," Communication Systems", TMH, 2nd Edition

[4]   Taub H. and Schilling D.L.," Principles of Communication Systems", TMH ,2001.
[5]   Proakis J. G. and Salehi M.," Communication Systems Engineering", Pearson Education,2002
[6]   Schaum's Outlines," Analog and Digital Communication", 3rd edition

Digital Learning Resources:

Course Name: Analog Communication
Course Link: https://nptel.ac.in/courses/117/105/117105143/
Course Instructor: Prof. Goutam Das, IIT Kharagpur
Course Name: Communication Engineering
Course Link: https://nptel.ac.in/courses/117/102/117102059/
Course Instructor: Prof. Surendra Prasad, IIT Delhi