Title of Course: Analog Communication and Transmission Line Theory

Code and Credit Structure: CT215 3-0-2-4

Course Placement: UG - Core Course for BTech (ICT & CS) – 4th Semester

Pre-Requisite: Signals and Systems, Electromagnetic Theory

Instructors: Prof. Deepak Ghodgaonkar and Prof. Sanjeev Gupta

Course Objective:
Rapid development in electronic communication systems is changing the face of human civilization, especially due to the convergence of wireless voice/data communications and internet technologies. Conventional analog communication is the backbone of any communication system and reemphasizes the importance of predominantly analog world steeped in digital technologies.

Course Outline:

(I) Analog Communication

Introduction to Analog Communication Systems, Elements and Limitations of Communication Systems, Modulation and Coding, Historical Perspective and Societal Impact. [2 lectures]

Linear CW modulation: Band pass signals and systems, AM, DSB, Signals and Spectra, Product Modulators, Square Law Modulators, Switched Modulators, Envelope Detection, SSB, VSB signals and Spectra, Generation and Synchronous Detection. [8 lectures]

Angle Modulation: Phase and Frequency Modulation, Narrowband PM and FM, Single Tone and Multitone Modulations, Transmission Bandwidth, Generation and Detection of FM and PM signals, De-emphasis and Pre-emphasis filtering, Noise in Communication systems, Thermal noise, Shot noise and Other Types of Noise. [10 lectures]

(II) Transmission Line Theory

Concept of Distributed Elements, Various Types of Transmission Lines, Circuit Model of a Uniform Transmission Line, Transmission Line Equations, Phase and Attenuation Constants, Propagation Constant and Characteristic Impedance, Lossless, Low-Loss and Distortion-less Lines, Travelling and Standing Waves, Reflection Coefficient, Standing Wave Ratio (SWR) and Return Loss, Matched, Short-circuit and Open-circuited Lines. [10 lectures]

Course Outcome:

At the end of the course, the student should be able to –

- understand the concept of mathematical representation of signal and noise.
- Identify the basic elements of an analog communication system and understands the functions performed by each of them.
- adequately familiarize with the comprehensive treatment of modulation, demodulation, transmission and reception of the analog signals.
- Apply theoretical concepts to solve easy as well as difficult problems.
- understand the concept of transmission lines operating at very high frequencies.
- explore scenario to learn more and apply concepts using hands-on experiments.

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References:


Evaluation:

In-Semester Examinations: 45%
End-Semester Examination: 45%
Laboratory Work: 10%
Total marks out of 100 will be converted to a letter grade using a 10-point scale.