

Course Code	Course Name	Theory	Practical	Tutorial	Theory	Oral & Practical	Tutorial	Total
ITC305	Principle of Communications	03	--	01	03	--	01	04

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Oral & Practical	Oral	Total
		Internal assessment			End Sem. Exam				
		Test1	Test 2	Avg. of 2 Tests					
ITC305	Principle of Communications	20	20	20	80	--	--	--	100

\$ 3 hours shown as theory to be taken class wise and 1 hour to be taken tutorial as batch wise

**Course Objectives:** Students will try to:

1. Study the basic principles and techniques used in analog and digital communications.
2. Understand the concept of noise and Fourier transform for designing and analysing communication system.
3. Acquire the knowledge of different modulation techniques such as AM , FM and study the block diagrams of transmitter and receiver.
4. Study the Sampling theorem and Pulse Analog Modulation techniques.
5. Learn the concepts of Digital modulation techniques such as PCM, DM, ADM and multiplexing techniques.
6. Gain the core idea of Electromagnetic Radiation and propagation of waves.

**Course Outcomes:** Students will be able to:

1. Differentiate analog and digital communication systems
2. Identify different types of noise occurred, its minimization and able to apply Fourier analysis in frequency & time domain to quantify bandwidth requirement of variety of analog and digital communication systems.
3. Design generation & detection AM, DSB, SSB, FM transmitter and receiver.
4. Apply sampling theorem to quantify the fundamental relationship between channel bandwidth, digital symbol rate and bit rate
5. Explain different types of line coding techniques for generation and detection of signals.
6. Describe Electromagnetic Radiation and propagation of waves.

**Prerequisite:** Basic Electrical Engineering

**Detailed syllabus:**

<b>Sr. No.</b>	<b>Module</b>	<b>Detailed Content</b>	<b>Hours</b>	<b>CO Mapping</b>
0	Prerequisite	Electrical engineering concepts, analog and digital electronics.	02	--
I	Introduction	Basics of analog communication systems (Block diagram), Sources of information, Baseband and band pass signals, Types of communication channels, Frequency / Spectrum allocations, Need for modulation and demodulation	03	CO1
II	Fourier Transform and Noise	Introduction to Fourier Transform, its properties (time and frequency shifting and convolution property), Fourier transform of unit step, delta and gate function. Correlated and uncorrelated sources of noise in communication system, Noise parameters –Signal to noise ratio, Noise factor, Noise figure, Friis formula and Equivalent noise temperature	05	CO2
III	Modulation and Demodulation (AM and FM)	AM: Amplitude modulation techniques and its types- DSBFC AM, DSBSC-AM, SSB SC AM- spectrum, waveforms, bandwidth, Power calculations. AM Receivers – Block diagram of TRF receivers and Super heterodyne receiver. Receiver characteristics - Sensitivity, Selectivity, Fidelity, Image frequency and its rejection and double spotting FM : Principle of FM- waveforms, spectrum, bandwidth. Pre-emphasis and de-emphasis in FM, FM noise triangle, Comparison of AM and FM systems, FM generation: Direct method –Varactor diode Modulator, Indirect method (Armstrong method) block diagram and waveforms. FM demodulator: Foster Seely discriminator, Ratio detector.	12	CO3
IV	Pulse Analog Modulation	Sampling theorem for low pass and band pass signals with proof, Anti- aliasing filter, PAM, PWM and PPM generation and	05	CO4

		Degeneration.		
V	Digital Modulation Techniques and Transmission	Introduction to digital communication (Block diagram), Quantization process, Pulse code modulation, Delta modulation, Adaptive delta modulation, Principle of time division multiplexing, Frequency division multiplexing and its applications. Introduction to Line codes, Inter-symbol interference, Binary phase shift keying, Differentially encoded phase shift keying, Quadrature phase shift keying, M-ary phase shift keying, Quadrature amplitude shift keying	08	CO5
VI	Radiation and Propagation of Waves	Electromagnetic radiation, fundamentals, types of propagation, ground wave, sky wave, tropospheric scatter propagation	04	CO6

#### Text Books:

1. Simon Haykin, Michael Moher, Introduction to Analog & Digital Communications, Wiley India Pvt. Ltd., 2nd Ed.
2. Herbert Taub, Donald L Schilling, Goutam Saha, Principles of Communication Systems, Tata McGraw Hill, 3rdEd.
3. V Chandrasekar, Communication Systems, Oxford University Press, 1st Ed.

#### References:

1. George Kennedy, Bernard Davis, SRM Prasanna, Electronic Communication Systems, Tata McGraw Hill, 5th Ed.
2. Wayne Tomasi, Electronic Communications Systems, Pearson Publication, 5th Ed.
3. BP Lathi, Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University.
4. K Sam Shanmugam, Digital and Analog Communication Systems, Wiley India Pvt. Ltd, 1st Ed.

#### Suggested Topics for Tutorials (Any 10):

1. Demonstration of Amplitude modulation.
2. Demonstration of Frequency modulation.
3. Study of AM/ FM receiver.
4. Demonstration of Signal sampling and reconstruction.
5. Study of PWM generation and detection.
6. Study of PCM coding and decoding.
7. Study of Delta modulation and demodulation
8. Demonstration of TDM/ FDM.
9. Demonstration of BPSK, BFSK, BASK
10. Study of QPSK
11. Study of Inter symbol Interference and Line coding.
12. Study of different types of Propagation.

## **Assessment:**

### **Internal Assessment for 20 marks:**

#### **Consisting of Two Compulsory Class Tests**

Approximately 40% to 50% of syllabus content must be covered in First test and remaining 40% to 50% of syllabus contents must be covered in second test.

### **End Semester Examination:** Some guidelines for setting the question papers are as:

- Weightage of each module in end semester examination is expected to be/will be proportional to number of respective lecture hours mentioned in the syllabus.
- Question paper will comprise of total **six questions, each carrying 20 marks.**
- **Q.1** will be **compulsory** and should **cover maximum contents of the syllabus.**
- **Remaining question will be mixed in nature** (for example if Q.2 has part (a) from module 3 then part (b) will be from any other module. (Randomly selected from all the modules.)
- Total **four questions** need to be solved.