

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ Practical	Tutorial	Total
SEITC306	Principles of Analog and Digital Communication	03	02	--	03	01	--	04

Subject Code	Subject Name	Examination Scheme								
		Theory Marks					Term Work	Practical	Oral	Total
		Internal assessment			End Sem. Exam					
		Test 1	Test 2	Avg. of 2 Tests						
SEITC306	Principles of Analog and Digital Communication	20	20	20	80	25	---	25	150	

Prerequisite

Basic knowledge of electrical engineering concepts and analog and digital electronics.

Course Objective

To introduce the basic principles and techniques used in analog and digital communications, involving analog and digital modulation techniques, communication receiver and transmitter design, baseband and bandpass communication techniques, line coding techniques, noise analysis and multiplexing techniques.

Course Outcome

The student can analyse analog communication systems, can understand differences between analog and digital representation and transmission of information, trade-offs (in terms of bandwidth, power, and complexity requirements) between basic analog and digital communication systems and can design basic analog or digital communication systems to solve a given communications problem.

Detailed Syllabus:

Module	Topics	Hours
1	Introduction Basics of analog communication systems (Block diagram), Sources of information, Baseband and bandpass signals, Types of communication channels, Frequency / Spectrum allocations, Need for modulation and demodulation	03
2	Fourier Transform and Noise Introduction to Fourier Transform, its properties, 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	04
3	Analog Modulation and Demodulation 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 transmission and reception: 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) FM demodulator: Foster Seely discriminator, Ratio detector.	11

4	Pulse Analog Modulation Sampling theorem for low pass and bandpass signals with proof, anti aliasing filter, PAM, PWM and PPM generation and degeneration.	04
5	Digital Modulation Techniques 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	04
6	Bandpass Modulation Introduction to Line codes, Intersymbol interference, Binary phase shift keying, Differentially encoded phase shift keying, Quadrature phase shift keying, M-ary phase shift keying, Quadrature amplitude shift keying, Binary frequency shift keying, M-ary frequency shift keying, Minimum shift keying. (Block diagram, spectrum and bandwidth calculation and applications in each case)	10
Total		(12 x 3)= 36 hours

Internal Assessment (IA):

Two tests must be conducted which should cover at least 80% of the syllabus. The average marks of both the tests will be considered as final IA marks.

Recommended Books

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, Ist Ed.

Reference Books

George Kennedy, Bernard Davis, SRM Prasanna, Electronic Communication Systems, Tata McGraw Hill, 5th Ed.

[1] Wayne Tomasi, Electronic Communications Systems, Pearson Publication, 5th Ed.

[2] BP Lathi, Zhi Ding, Modern Digital and Analog Communication Systems, Oxford University Press, 4th Ed.

[4] K Sam Shanmugam, Digital and Analog Communication Systems, Wiley India Pvt. Ltd, 1st Ed.

Suggested Topics of Experiments

1. Amplitude modulation - generation and detection
2. Frequency modulation generation and detection
3. Study of AM/ FM receiver
4. Signal sampling and reconstruction
5. PWM generation
6. PCM coding and decoding
7. Delta modulation and demodulation
8. TDM/ FDM
9. BPSK
10. BFSK
11. BASK
12. QPSK
13. Study of eye pattern

Term Work:

Term work shall consist of at least 08 experiments from the suggested topics. 04 experiments out of these have to be performed on hardware and 04 can be performed using suitable simulation software.

Distribution of marks for term work shall be as follows:

1. Attendance (Theory and Practical): 05 Marks
2. Laboratory work (Experiments and Journal): 10 Marks
3. Assignments: 10 Marks

The final certification and acceptance of TW ensures the satisfactory performance of laboratory Work and Minimum Passing in the term work.

Theory Examination:

- Question paper will comprise of 6 questions, each carrying 20 marks.
- Total 4 questions need to be solved.
- Q.1 will be compulsory, based on entire syllabus wherein sub questions of 2 to 3 marks will be asked.
- Remaining question will be randomly selected from all the modules.

Weightage of marks should be proportional to number of hours assigned to each mo