Devi Ahilya University, Indore, India Institute of Engineering & Technology				**III Year B.E. (Electronics & Instrumentation Engg.)**			
Subject Code & Name	**Instructions Hours per Week**			**Credits**			
4EIRG2	**L**	**T**	**P**	**L**	**T**	**P**	**Total**
ANALOG AND DIGITAL COMMUNICATION	**3**	**1**	**2**	**3**	**1**	**1**	**5**
Duration of Theory Paper: 3 Hours							

Learning Objectives:

- The course contents are aimed to provide the basics of signals and linear time invariant systems used in communication systems
- To review the basic Fourier techniques and its application in these processes.
- To provide knowledge of basic principles of analog and digital communication.
- To introduce the various processes like sampling, digital coding techniques, modulation and channel coding techniques that are used in modern telecommunication system.

Prerequisites: The basic knowledge of signals and systems and probability theory.

COURSE OF CONTENTS

UNIT-I

Signals and Systems: Types of signals-deterministic & random, periodic & non-periodic, analog & discrete, energy & power signals, Fourier series, Fourier transform & its properties, convolution, signal transmission through LTI systems, auto correlation, cross correlation, energy and power spectral density, their relationship with correlation function, probability, random variables & their moments, Gaussian probability density functions, its mean and variance.

UNIT-II

Amplitude Modulation: need of modulation in a communication system, block schematic of a typical communication system, AM modulation system, modulation index, generation (square law & switching modulator) & detection (envelope & square law detector) of AM wave, side bands & power content in an AM wave, a brief review of DSB-SC, SSB, VSB, AM transmitter block diagram, super heterodyne radio receivers and its advantages.

UNIT-III

Frequency Modulation: relationships between phase & frequency modulation, narrowband FM, wide band FM & their spectrum, transmission bandwidth of

FM and PM signals, FM generation methods (direct & indirect) & FM detection methods (discriminators: balanced, phase shift and PLL detector), pre-emphasis & de-emphasis, FM transmitters, FM receivers (block diagram), comparison with AM systems in presence of noise, frequency division multiplexing.

UNIT-IV

Sampling, Digital encoding & Line coding: sampling theorem, types of sampling, quantization, digital encoding techniques PCM, DPCM, DM, ADM, line coding techniques NRZ, RZ, Biphase, Duo Binary, their comparison based on various desirable properties.

UNIT-V

Digital modulation & Channel coding: A brief overview of generation, detection, constellation points of digital modulation techniques, ASK, FSK, PSK, MSK, introduction to optimum filter, matched filter. Channel coding techniques: error detection and correction codes, parity check code, minimum distance, hamming distance, overview of linear block code, cyclic code, convolutional code and their applications.

Learning Outcomes:

Upon completing the course, students will be able to:

- Understand basics of signals, frequency domain analysis & its importance.
- Understand the working of transmitter and receiver in analog & digital communication system.
- Understand about the digital data transmission using line coding.
- Understand how to detect and correct the errors introduced during the transmission.

BOOKS RECOMMENDED:

[1] Lathi B.P., *Analog and Digital Communication Systems*, 3/e, Oxford Press, 2007
[2] Proakis and Salehi, *Fundamentals of Communication Systems*, Pearson Education, 2005
[3] Taub & Schilling, *Principles of Communication Systems*, 4/e, McGraw Hill, 2013
[4] Bernard Sklar, *Digital communication*, 2/e, Pearson Education, 2007.
[5] Haykins Simon, *Analog and Digital Communication*, 3/e Willey Publication, 2007.
[6] Singh R.P. & Sapre, *Communication systems Analog & Digital*, TMH, 2007
[7] Carlson, *Communication Systems*, McGraw Hill, 2004

List of Practical Assignments:

1. To study the working of sampling and reconstruction techniques for various sampling frequencies.
2. To study even/odd parity check code for single bit error detection.
3. To perform time division multiplexing and de- multiplexing.
4. Study and analysis of pulse code modulation and demodulation.
5. To study various data formatting schemes (unipolar, polar, AMI etc.).

6. Study and analysis of amplitude modulation & demodulation for different modulation index values.
7. Study and analysis of frequency modulation and demodulation.
8. Study and analysis of ASK modulation and demodulation.
9. Study and analysis of BPSK modulation and demodulation.
10. Study and analysis of QPSK modulation and demodulation.