ANALOG COMMUNICATIONS

IV Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC005	Core	3	1	-	4	30	70	100
Contact Classes: 45	**Tutorial Classes: 15**	**Practical Classes: Nil**				**Total Classes: 60**		

OBJECTIVES:

The course should enable the students to:

I. Develop skills for analyzing different type's signals in terms of their properties such as energy, power, and correlation and apply for analysis of linear time invariant systems.
II. Analyze various techniques of generation and detection of amplitude modulation (AM), frequency modulation (FM), and phase modulation (PM) signals.
III. Differentiate the performance of AM, FM, PM systems in terms of Power, Bandwidth and SNR (Signal-to-Noise Ratio).
IV. The major objectives of this subject are for the students to establish a firm foundation for the understanding of telecommunication systems and evaluate analog Communication system in terms of the complexity of the transmitters and receivers.

COURSE LEARNING OUTCOMES (CLOs):

1. Discuss the modeling of idealized signals and analyze the periodic signals with the help of Fourier Transform..
2. Discuss about the system and their classifications based on properties and derive the transfer function of linear time variant and invariant system.Use the concept of random variables in real-world problem like graph theory, machine learning, Natural language processing.
3. Understand and analyze the concept of convolution and correlation of signals.
4. Discuss about the basic elements of communication system, importance of modulation and different types of modulation.
5. Understand the time domain, frequency domain description and power relations of amplitude modulation, various techniques of generation and detection of AM. Noise in AM.
6. Analyze the time domain, frequency domain description of Double Side Band Suppressed Carrier (DSB SC), various generation techniques and detection techniques of DSB SC, Noise in DSB SC.
7. Understand the time domain, frequency domain description of amplitude modulation single side band modulated wave, various techniques of generation and detection of SSB, Noise in SSB SC.Explain multiple random variables and the covariance of two random variables.
8. Analyze the time domain, frequency domain description of Vestigial side band modulation, generation and detection of VSB.
9. Discuss the comparison of different amplitude modulation techniques and applications of various amplitude systems.
10. Analyze the basic concepts of Frequency modulation like single tone , spectrum analysis of frequency modulated wave and transmission bandwidth of FM.
11. Understand the concepts of narrow band frequency modulation, wide band frequency modulation and pre emphasis and de emphasis circuits in FM.
12. Discuss the generation of frequency modulation waves by direct method and indirect method and detection methods like balanced frequency discriminator, foster seeley discriminator, phase locked loop etc.,
13. Discuss the concept of receivers in communication system and receiver types like tuned radio

frequency receiver and super heterodyne receiver.

14. Analyze the characteristics of the receiver like sensitivity, selectivity, image frequency rejection ratio, choice of intermediate frequency and fidelity.
15. Understand the concept of sampling and its types, and analyze the graphical and analytical proof for band limited signals.
16. Apply the concept of analog communication to understand and analyze real time applications.
17. Acquire the knowledge and develop capability to succeed national and international level competitive examinations.

Unit-I	SIGNAL ANALYSIS AND LTI SYSTEMS	Unit-I

Classification of signals and study of Fourier transforms for standard signals, definition of signal bandwidth; Systems: Definition of system, classification of systems based on properties, linear time invariant system , impulse, step, sinusoidal response of a linear time invariant system, transfer function of a linear time invariant system, distortion less transmission through a linear time invariant system; system bandwidth; Convolution and correlation of signals: Concept of convolution, graphical representation of convolution, properties of convolution; Cross correlation ,auto correlation functions and their properties, comparison between correlation and convolution

Unit-II	AMPLITUDE AND DOUBLE SIDE BAND SUPPRESSED CARRIER MODULATION	Unit-II

Introduction to communication system, need for modulation, frequency division multiplexing; Amplitude modulation, definition; Time domain and frequency domain description, single tone modulation, power relations in amplitude modulation waves; Generation of amplitude modulation wave using ,square law and switching modulators; Detection of amplitude modulation waves using square law and envelope detectors; Double side band modulation: Double side band suppressed carrier time domain and frequency domain description; Generation of double side band suppressed carrier waves using balanced and ring modulators; Coherent detection of double side band suppressed carrier modulated waves; Costas loop; Noise in amplitude modulation, noise in double side band suppressed carrier.

Unit-III	SINGLE SIDE BAND MODULATION AND VESTIGIAL SIDE BAND MODULATION	Unit-III

Frequency domain description, frequency discrimination method for generation of amplitude modulation single side band modulated wave; time domain description; Phase discrimination method for generating amplitude modulation single side band modulated waves; Demodulation of single side band waves.
Noise in single side band suppressed carrier; Vestigial side band modulation: Frequency description, generation of vestigial side band modulated wave; Time domain description; Envelope detection of a vestigial side band modulation wave pulse carrier; Comparison of amplitude modulation techniques; applications of different amplitude modulation systems.

Unit-IV	ANGLE MODULATION	Unit-IV

Basic concepts, frequency modulation: Single tone frequency modulation, spectrum analysis of sinusoidal frequency modulation wave, narrow band frequency modulation, wide band frequency modulation, transmission bandwidth of frequency modulation wave, phase modulation, comparison of frequency modulation and phase modulation; Generation of frequency modulation waves, direct frequency modulation and indirect frequency modulation, detection of frequency modulation waves: Balanced frequency discriminator, Foster Seeley discriminator, ratio detector, zero crossing detector, phase locked loop, comparison of frequency modulation and amplitude modulation; Noise in angle modulation system, threshold effect in angle modulation system, pre-emphasis and de-emphasis.

Unit-V	RECEIVERS AND SAMPLING THEORM	Unit-V

Receivers: Introduction, tuned radio frequency receiver, super heterodyne receiver, radio frequency amplifier, mixer, local oscillator, intermediate frequency amplifier, automatic gain control; Receiver characteristics: Sensitivity, selectivity, image frequency rejection ratio, choice of intermediate frequency, fidelity; Frequency modulation receiver, amplitude limiting, automatic frequency control, comparison with amplitude modulation receiver; Sampling: Sampling theorem, graphical and analytical proof for band limited signals, types of sampling, reconstruction of signal from its samples.

Text Books:

1. B.P. Lahti, “Signals, Systems and Communications”, BS Publications, 5th Edition, 2009.
2. S. S. Haykin, “Communication Systems”, Wiley Eastern, 2nd Edition, 2006.
3. Taub, Schilling, “Principles of Communication Systems”, Tata McGraw-Hill, 4th Edition, 2013

Reference Books:

1. B.P. Lathi, “Communication Systems‖, BS Publication”, 2nd Edition, 2006.
2. John G. Proakis, Masond, Salehi, “Fundamentals of Communication Systems”, PEA, 1st Edition, 2006
3. George Kennedy, Bernard Davis, “Electronics and Communication System”, Tata McGraw Hill , 5th Edition, 2011.

Web References:

1. http://www.web.eecs.utk.edu
2. https://everythingvtu.wordpress.com
3. http://nptel.ac.in/
4. http://www.iare.ac.in

E-Text Books:

1. http://www.bookboon.com/
2. http://www.jntubook.com
3. http://www.smartzworld.com
4. http://www.archive.org