Short Syllabus

BECE304L Analog Communication Systems (3-0-0-3)

Communication Systems - Elements of a communication system, Need for modulation; Amplitude Modulation (AM) - Generation of AM signals; Bandwidth and Power Efficient AM Systems - Balanced modulator and Ring modulator, Synchronous detection; Angle Modulation PrinciplesofFrequencyModulation(FM)andPhaseModulation(PM);TransmittersandReceivers - Radio transmitter and receiver; Noise in Communication Systems - Noise and its types, AM and FM receivers; Pulse Modulation Systems - Sampling theorem , Types of Sampling.

Course Code	Course Title	L	T	P	C
BECE304L	Analog Communication Systems	3	0	0	3
Pre-requisite	BECE206L, BECE206P	Syllabus version			
		1.0			

Course Objectives:

1. To explore the architectural elements and models used in analog communication systems.
2. To analyse bandwidth, current, power and transmission efficiency of analog modulations.
3. To understand the functionalities of transmitters and receivers.
4. To comprehend the effect of noise in analog communication systems.

Course Outcomes:

Students will be able to

1. List and analyse the key elements of analog communication system.
2. Design the various Amplitude Modulation Schemes and evaluate in terms of its power, bandwidth and transmission Efficiency.
3. Examine the various angle modulation schemes.
4. Infer the working principle of radio transmitters and receivers.
5. Analyse the effect of noise on various analog modulations.
6. Analyse various pulse modulation and multiplexing techniques.

Module:1	Communication Systems	4 hours

Need and importance of communication, Elements of communication system - Types of communication systems, Electromagnetic spectrum used in communication, Concept of bandwidth and power, Need for modulation.

Module:2	Amplitude Modulation (AM)	7 hours

Amplitude modulation – Single- tone and Multi-tone, Mathematical representation of AM signal, Bandwidth, current, power and transmission efficiency of AM. Generation of AM signal – Square law modulator, Switching modulator. AM demodulation – Envelope detector and Square law demodulator.

Module:3	Bandwidth and Power Efficient AM Systems	7 hours

DSB-SC generation – Balanced modulator and Ring modulator. DSB-SC demodulation – Synchronous detection, Effect of phase drift. SSB-SC generation – Filter, Phase shift and Third method. SSB-SC demodulation - Synchronous detection. VSB generation and demodulation. Power, bandwidth and transmission efficiency of DSB-SC, SSB-SC and VSB.

Module:4	Angle Modulation	10 hours

Principles of Frequency Modulation (FM) and Phase Modulation (PM) – Relation between FM and PM, Frequency deviation and bandwidth of FM, Narrow band and Wide band FM, Bessel functions and Carson's rule. FM generation and detection. Comparison of amplitude and angle modulation.

Module:5	Transmitters and Receivers	5 hours

Radio transmitter - Classification of transmitters - Low level and High level AM Transmitters, FM Transmitter. Radio receiver - Receiver characteristics, Tuned Radio Frequency (TRF) Receiver, Superheterodyne receiver (AM and FM), Choice of IF and oscillator frequencies, Tracking and Alignment – AGC, AFC. Pre-emphasis and De-emphasis.

Module:6	Noise in Communication Systems	6 hours

Noise and its types- Noise voltage and power, Signal-to-Noise Ratio (SNR), Noise figure, Noise temperature. Figure of Merit in DSB-SC, SSB-SC, AM and FM receivers.

Module:7	**Pulse Modulation Systems**	**4 hours**
Sampling theorem - Types of Sampling. Pulse modulation schemes – generation and detection PAM, PPM and PWM, Conversion of PWM to PPM. Multiplexing Techniques – FDM and TDM.		
Module:8	**Contemporary Issues**	**2 hours**
	Total lecture hours:	**45 hours**

Text Books	
1.	George Kennedy, Bernard Davis, Electronic Communication Systems, 2017, 6th Edition, Mc Graw Hill Education, New Delhi, India.
Reference Books	
1.	Simon Haykin, Communication Systems, 2019, 5th Edition, Wiley, India.
2	P. Ramakrishna Rao, Analog Communication, 2017, Tata McGraw Hill Education Pvt Ltd., India.
3	Herbert Taub and Donald Schilling, Principles of Communication Systems, 2017, 4th Edition, Mc Graw Hill Education, India.
4	HweiKsu and Debjani Mitra, Analog and Digital Communication, 2017, 3rd Edition, McGraw Hill Education, India.

Mode of Evaluation: Continuous Assessment Test, Digital Assignment, Quiz and Final Assessment Test			
Recommended by Board of Studies	14-05-2022		
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