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DIGITAL COMMUNICATION

Paper Code	**ECS-704**
Course Credits	4
Lectures/ Week	3
Tutorials/ Week	1
Course description	**UNIT – IANALOG-TO-DIGITAL CONVERSION (ADC) OF BASEBAND SIGNAL**

Pulse Code Modulation (PCM), Sampling, Quantization,Encoding, Quantization Noise and Signal-to-Quantization Noise Ratio (SQNR), Companders, Differential PCM (DPCM), Delta Modulation (DM), Adaptive Delta Modulation (ADM).

UNIT- IIDIGITAL BASEBAND SIGNAL TRANSMISSION
Basic Building Blocks of Digital Communication systems.

Digital Signaling: Binary and M-ary Signals, PCM Formats, PAM and Orthogonal symbols, Gram-Schimdt Orthogonolization Procedure (GOP), Constellation Diagram.

PCM Formats/Line Codes: Unipolar, Polar, Bipolar, Dipolar (OOK and Antipodal), AMI and CMI Line Codes.

Bandwidthand Power of Line Codes: Power Spectral Density (PSD) of General Line Code, PSD and Bandwidth of various Line Codes.

Baseband Signal Transmission through Bandlimited Channels: Intersymbol Interference (ISI), Receiver Output in the Presence of ISI, Nyquist's First Criterion for Zero ISI: Ideal and Practical Solutions, Criterion for controlled ISI: Correlative Coding, Eye Pattern

UNIT III DIGITAL BANDPASS MODULATION
Types of Digital Bandpass Modulation, Mathematical Representation, Constellation Diagrams, Frequency Spectrum, Bandwidth and Generation of the following Digital Bandpass Modulation techniques:
Amplitude Shift Keying (ASK): Binary ASK (On-Off Keying), M-ary ASK

Phase Shift Keying (PSK): Binary PSK (BPSK), M-ary PSK (MPSK), Differential PSK (DPSK), Quadrature PSK (QPSK).
Frequency Shift Keying (FSK): Binary FSK (BFSK), M-ary FSK (MFSK), Continuous Phase FSK (CPFSK), Minimum Shift Keying (MSK), and Gaussian-filtered MSK (GMSK).

UNIT-IV : OPTIMUM RECEIVERS: DEMODULATORS AND DETECTORS OF DIGITAL SIGNALS IN AWGN

Optimum Demodulators: Matched Filter Demodulator, Properties of Matched Filter, Correlation-type Demodulator, Matched Filter and Correlation-type Optimum Demodulators for Binary and M-ary signals.
Optimum Detectors: Maximum *a posteriori* (MAP) Criterion, Maximum Likelihood (ML) Criterion.

UNIT-V SYNCHRONIZATION, DEMODULATION AND DETECTION OF DIGITAL BANDPASS MODULATED SIGNALS

Carrier Synchronization: M^{th} Power PLL
Symbol Synchronization: Early-Late Gate Synchronization.
Demodulation and Detection: Coherent &Non-Coherent Techniques
ASK: Coherent BASK, MASK
PSK: Coherent BPSK, MPSK, QPSK &Non-Coherent DPSK
FSK: Coherent & Non-Coherent MFSK, Optimum Detection of BFSK

Pre-requisite

Course/Paper: ECS-404 Communication Systems, Maths III

Text Book: 1. J G Proakis& Masoud Salehi, "Digital Communications", Mc Graw Hill Education, 5th Edn., 2014.

2. SimonHaykin, "Digital Communications", Wiley India Edition, 2006.

Reference Books: 1. B P Lathi &Zhi Ding, "Modern Digital & Analog Communication Systems", Oxford University Press, 4th Edn., 2011.

2.. Leon W Couch II," Digital & Analog Communication Systems", Prentice Hall of India, 7th Edn., 2008

Course Outcomex: **CO1:** To become familiar with Analog-to-Digital converters for baseband signal such as PCM, DPCM, DM and ADM.

CO2: A thorough understanding of digital signalling for the baseband signal transmission , line codes and applying various pulse-shaping techniques to combat the ISI present in the received signal.

CO3: To familiarize with different types of digital modulation schemes such as ASK, PSK, FSK and their different forms.

CO4: An ability to design demodulators and detectors for digital signal in the presence of AWGN.

CO5: A thorough understanding of synchronization demodulation and detection of digital bandpass modulated signals.

Computer usage/

Software required: MATLAB

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