COMMUNICATION SYSTEMS

Paper Code	**ECS-404**
Course Credits	4
Lectures/ Week	3
Tutorials/ Week	1
Course Description	**UNIT- IAMPLITUDE MODULATION (AM)**

Basic Communication System Model, Modulation, Need of Modulation, double side band suppressed carrier modulation (DSB-SC), single side band (SSB),Independent Sideband (ISB) Modulation, Vestigial Sideband (VSB) Transmission, Comparison of various AM Systems,

UNIT- II ANGLE MODULATION

Angle Modulation: Frequency and Phase Modulation.

Frequency Modulation (FM): Time Domain and Frequency Domain Representation, Power Distribution and Bandwidth of FM Signal, Carlson's Rule, Narrow Band FM (NBFM), Wide-Band FM (WBFM), Effect of Noise in FM signal-Noise Triangle, Emphasis and De-emphasis.

Phase Modulation (PM): Brief Description of Phase Modulation, Relation between FM and PM.

Generation of FM Signals: Direct and Indirect Methods

- **Direct Method:** Varactor Diode FM Modulator
- **Indirect Method:**Armstrong Method for NBFM, Generation of WBFM.

- **Audio FM Generation:** Monophonic and Stereophonic.

UNIT III RADIO RECEIVER

Demodulation: Synchronous and Asynchronous Demodulation, Effect of Frequency and Phase Errors in Synchronous Demodulation.

Carrier Recovery: Square-Law PLLand Costas Loop

Demodulation of AM Signals: Demodulation of DSB-FC, DSC-SC, SSB and VSB AM Signals

Demodulation of FM signal: Frequency Discriminators and Phase Discriminators, Foster-Seeley Phase Discriminator, Ratio Detector.

Radio Receivers: Superhetrodyne Radio Receiver, Advantages.

Superhetrodyne AM Receiver: Block Diagram, Intermediate Frequency (IF), Automatic Gain Control (AGC).

Superhetrodyne FM Receiver: Block Diagram, Intermediate Frequency (IF), Automatic Frequency Control (AFC), Monophonic and Stereophonic FM Receivers.

Performance of Radio Receivers: Sensitivity, Selectivity, Fidelity, Image Frequency and Image Frequency Rejection Ratio

UNIT-IV NOISE PERFORMANCE OF COMMUNICATION SYSTEMS

Bandpass Noise Representation, Concept of Pre-envelope, Signal-to-Noise Ratio (SNR) in Radio Receivers

Noise in AM Receivers: Noise in AM Receivers Using Coherent Detection (DSB-SC and SSB), Noise in AM Receivers Using Envelop Detection(DSB-FC) and Threshold Effect.

Noise in FM Receivers: Noise in FM Receivers when Signal Strength is greater than the Noise, Capture Effect, Threshold Effect and its Improvement through De-emphasis.

UNIT-V PULSE MODULATION

Sampling Theorem, Pulse Modulation, Pulse Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Frequency Division Multiplexing (FDM), L-Carrier Hierarchy System, Time Division Multiplexing (TDM), Brief Description of T-Carrier Hierarchy System.

Pre-requisite

Course/Paper Maths III

Text Book

1. **J G Proakis &MasoudSalehi,** "Fundamentals of Communication Systems", Pearson Education, 2013.

2. **SimonHaykin**, "Communication Systems", 4thEdn.,Wiley Eastern Ltd., 2001.

Reference Books

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

2. **LeonWCouchII**," Digital &Analog Communication Systems", Pearson Education, 8thEdn., 2014.

Course Outcome:

CO1: To become familiarize with the Amplitude Modulation, its various forms, its time-domain and frequency-domain representation, and generation of its various forms.

CO2: To have thorough understanding of Frequency and Phase Modulation, time-domain and frequency-domain representation of FM, Narrowband and Wideband FM, and generation FM signals.

CO3: To study the demodulation techniques of AM and FM signals, AM and FM receivers and performance parameters of radio receivers.

CO4: To study the Bandpass and Lowpass noise in communication systems and the noise performance of various AM and FM receivers.

CO5: To become familiarize with Pulse Modulation techniques and various Multiplexing schemes and their applications in communication systems.

Computer usage/

Software required: MATLAB