Gyanmanjari Innovative University

Course Syllabus
Gyanmanjari Diploma Engineering college
Semester-3 (Diploma)

Subject: Analog Communication System - DETEC13201

Type of course: Major

Prerequisite: Electrical circuits, Basic Mathematics

Rationale:

Analog communication is the backbone of traditional signal transmission systems like radio, television, and telephony. This course provides fundamental knowledge of modulation techniques, noise analysis, and receiver design, essential for understanding modern communication technologies. It bridges the gap between analog and digital communication, helping students grasp signal processing concepts. Through theoretical and practical exposure, students develop skills required for careers in telecommunications, broadcasting, and electronics. This course prepares students for advanced studies in communication engineering.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks					
				Theory Marks		Practical Marks		CA	Total Marks
CI	T	P	C	ESE	MSE	V	P	ALA	
4	0	2	5	60	30	10	20	30	150

Legends: CI-Classroom Instructions; T – Tutorial; P - Practical; C – Credit; ESE - End Semester Examination; MSE- Mid Semester Examination; V – Viva; CA - Continuous Assessment; ALA- Active Learning Activities.

GYANMANJARI INNOVATIVE UNIVERSITY BHAVNAGAR

Course Content:

Unit No.	Course content	Hrs	% Weightage
1	**Amplitude Modulation** Introduction, Orientation Introduction to communication system, Need for modulation, Amplitude modulation, Time domain and Frequency domain description, Power relations in AM wave, , Square law modulator, Switching modulator, Detection of AM waves, Square law detector, Envelope detector. DSB-SC modulation, time domain and frequency domain description, Generation of DSB-SC waves, Balanced Modulator, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop.	12	20%
2	**SSB Modulation** Frequency domain description, Frequency discrimination method for generation of AM-SSB Modulated wave, Time domain description, Phase discrimination method for generating of AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial sideband modulation, Generation of VSB modulated wave, Time domain description, Envelop detection of VSB wave pulse carrier, Comparison of AM techniques, Applications of different AM waves.	12	20%
3	**Angle Modulation Concepts** Frequency Modulation, Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM wave, Generation of FM Waves, Comparison of AM & FM. Generation of FM wave: Direct method, parametric variation method, varactor diode, Reactance modulator, Armstrong method, Detection of FM waves, balanced frequency discriminator, Zero crossing detector, Phase locked loop.	12	20%
4	**Noise** Types of noise: Resistive noise, shot noise, white noise, narrow band noise in phase and Quadrature phase components and its properties. modeling of noise sources, Average noise bandwidth, effective noise temperature, average noise figure, average noise figure of cascaded networks. Nose in DSB and SSB system, Nose in A M system, Nose in angie modulated system, Threshold effect in Angle modulation system, Pre-emphasis and De-emphasis.	12	20%

5	**Receivers** Receiver types, Tuned Radio Frequency receivers, Super heterodyne receiver, RF section and characteristics, Frequency changing and Tracking, Intermediate frequency, AGC, FM receiver, Comparison with AM receiver, amplitude limiting PULSE **Modulation** Types of pulse modulation PAM, PWM, Generation and Demodulation of PWM, PPM, Generation and Demodulation of PPM	12	20%

Continuous Assessment:

Sr. No	Active Learning Activities	Marks
1	**Case Study on Real-World Analog Communication Applications** Students will find case studies that illustrate the application of analog communication in aviation, such as air traffic control or aircraft communication systems. Upload report on GMIU portal.	10
2	**Simulation of Modulation Techniques** Using MATLAB or any relevant software, students will simulate AM, FM, and pulse modulation techniques to observe their effects on signal transmission. Upload simulation on GMIU portal.	10
3	**Design and Implementation of an AM/FM Receiver** - Students will design and build a basic AM or FM receiver using available electronic components and analyze its performance. Upload video in GMIU portal. (No. of students per group - 03)	10
Total		30

Suggested Specification table with Marks (Theory):60

Distribution of Theory Marks (Revised Bloom's Taxonomy)						
Level	Remembrance (R)	Understanding (U)	Application (A)	Analyze (N)	Evaluate (E)	Create (C)
Weightage	30%	30%	30%	10%	0	0

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Course Outcome:

After learning the course the students should be able to:	
CO1	Understand the need for modulation and different AM techniques.
CO2	Compare AM techniques like DSB-SC, SSB, and VSB.
C03	Explain frequency and phase modulation techniques.
CO4	Analyze noise effects in communication systems.
CO5	Learn radio receivers, AM/FM comparison, RF characteristics, and pulse modulation (PAM, PWM, PPM).

List of Practical:

Sr. No	Descriptions	Unit No	Hrs
1.	To Study and analyze the generation and detection of AM signals using an envelope detector circuit.	1	4
2.	To Study & Implementation of Double Sideband Suppressed Carrier (DSB-SC) modulation and demodulation circuit.	1	2
3.	To demonstrate the working principle of Single Sideband (SSB) modulation and its advantages over AM and DSB-SC.	2	2
4.	To study Frequency Modulation and Demodulation to Generate FM signals and study their detection techniques.	3	4
5.	Study of Spectrum Analyzer and Analysis of AM and FM Signals to observe and compare AM and FM signals.	3	2
6.	Implementation of pre-emphasis and de-emphasis networks to reduce noise in FM transmission.	3	2
7.	To Study the principle and working of Time Division Multiplexing & Demultiplexing Systems and analyze their advantages.	5	2
8.	To Demonstrate Frequency Division Multiplexing & Demultiplexing techniques and their application in communication systems.	5	2
9.	To Generate and analyze Pulse Amplitude Modulation & Demodulation signals, and their reconstruction.	5	2
10.	To Implement Pulse Amplitude Modulation & Demodulation techniques and analyze their characteristics.	5	2

11.	To Study and Generate Pulse Position Modulation & Demodulation signals and their detection process.	5	2
12.	To Implement a Phase-Locked Loop (PLL) circuit and analyze its performance in FM modulation.	3	4
	TOTAL		30

Instructional Method:

The course delivery method will depend upon the requirement of content and the needs of students. The teacher, in addition to conventional teaching methods by black board, may also use any tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.

From the content 10% topics are suggested for flipped mode instruction.

Students will use supplementary resources such as online videos, NPTEL/SWAYAM videos, e-courses, Virtual Laboratory

The internal evaluation will be done on the basis of Active Learning Assignment

Practical/Viva examination will be conducted at the end of semester for evaluation of performance of students in the laboratory.

Reference Books:

[1] H. Taub, D. L. Schilling, and G. Sahe, Principles of Communication Systems, 3rd ed., New Delhi: Tata McGraw-Hill.
[2] S. Haykin, Principles of Communication Systems, 2nd ed., New York: John Wiley.
[3] G. Kennedy and B. Davis, Electronics and Communication System, New Delhi: Tata McGraw-Hill
[4] K. N. Hari Bhat and G. Rao, Analog Communications, 2nd ed., Pearson Publications.
[5] R. P. Singh and S. P. Sapre, Communication Systems, 2nd ed., New Delhi: Tata McGraw-Hill, 2007.
[6] B. P. Lathi, Communication Systems, Hyderabad: BS Publications, 2006