LAHORE COLLEGE FOR WOMEN UNIVERSITY

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DEPARTMENT OF ELECTRICAL ENGINEERING
Course Descriptive File

1	Course Title	Communication Systems
2	Course Code	EE-
3	Credit Hours	4(3,1)
4	Pre-requisites	**SIGNALS AND SYSTEMS, PROBABILITY METHODS IN ENGINEERING**
5	Co-requisites	Digital Signal Processing
6	Semester	VI
7	Resource Person Theory	Ms. Ismat Hira
8	Contact Hours (Theory)	48
9	Contact Hours (Lab)	48
10	Office Hours	8AM to 4PM
11	Email	ismat_hira@yahoo.com

12	Course Outline as per Scheme of Studies (SoS)

Amplitude Modulation: Baseband and carrier communications, Double Sideband (DSB), Single Sideband (SSB), Vestigial Sideband (VSB), Super heterodyne AM Receiver, Carrier Acquisition, Television, Angle Modulation: Instantaneous frequency, Bandwidth of FM/PM, Generation of FM/PM, Demodulation of FM/PM. Noise: Mathematical representation, Signal to Noise Ratio, Noise in AM, FM, and PM systems Pulse Modulation**:** Sampling and Quantization, Pulse Amplitude Modulation, Pulse Position and Pulse Width Modulation, Quantization Noise, Signal to Quantization Noise Ratio, Pulse code Modulation, Delta Modulation, Frequency Shift Keying, Phase Shift Keying.

13	Course Objectives as per SoS

1- Analyze the analog-to-digital conversion process with emphasis on Nyquist Sampling Criteria, line coding, pulse shaping and optimum detection functions.

2- Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.

3- Develop and compare the performance of binary, M-ary and spread spectrum digital communications in the presence of noise and interference. Design of linear systematic block coding and its error detection/correction capability is also discussed.

14	Books

Text Book:

- B. P. Lathi and Zhi Ding, "Modern Digital and Analog Communication Systems", Oxford University Press, Latest Edition..

Reference:

- Simon Haykin, "Communication Systems", John Wiley, Latest Edition.

15 Course Learning Outcomes (CLOs)

Ser	CLO	Domain	Taxonomy level	PLO
1.	Understand the basic concepts of the analog and digital communication systems in terms of A/D, D/A conversion.	Cognitive	3	2
2.	Compute modulation index, bandwidth and power requirements for various analog modulation schemes including AM,FM and PM	Cognitive	3	2
3.	Model digital communication signals and systems using appropriate modulation techniques along with their constellation diagrams(e.g., BPSK, ASK,QAM etc)	Cognitive	3	3
4.	Provide sound evaluation of practical digital communication systems in terms of their performance and complexity. (Source coding, Channel coding, example codes BCH, RS codes)	Cognitive	3	3

16 Marks Breakup

Theory

Quizzes	10%
Homework/assignments	10%
Midterm exam	25%
Terminal exam (3 hours)	30%
Total (theory)	65%

Lab

Total (lab)	25%

Final marks	Theory marks * 0.75 + Lab marks * 0.25

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Week	**Topic**	**CLO**	**Taxonomy Level**	**Specific Outcome**	**Contact Hours**	**Assessment**
1.	Introduction to Communication Systems (Digital and Analog	CLO1	**C2**		3 Hours	Assignment 1 Quiz 1
2.	Noise: Mathematical representation, Signal to Noise Ratio	CLO1	**C2**	Analyze the analog-to-digital conversion process with emphasis on Nyquist Sampling Criteria, line coding, pulse shaping and optimum detection functions.	3 Hours	
3.	Pulse Modulation**:** Sampling and Quantization,	CLO1	**C3**	Analyze the analog-to-digital conversion process with emphasis on Nyquist Sampling Criteria, line coding, pulse shaping and optimum detection functions.	3 Hours	
4.	Pulse Amplitude Modulation, Pulse Position and Pulse Width Modulation	CLO1	**C3**	Analyze the analog-to-digital conversion process with emphasis on Nyquist Sampling Criteria, line coding, pulse shaping and optimum detection functions.	3 Hours	Assignment 2 Quiz 2
5.	Amplitude Modulation: Baseband and carrier communications, Double Sideband (DSB) aong with generation and demodulations	CLO2	**C3**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	
6.	Single Sideband (SSB), Vestigial Sideband (VSB)	CLO2	**C3**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	

7.	Bandwidth of FM/PM, Generation of FM/PM,	CLO2	**C2**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	Assignment 3 Quiz 3
8.	Phase locked loop, Super heterodyne AM Receiver, Carrier Acquisition,	CLO2	**C2**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	
9.	Basic Block diagram of Digital Communication System	CLO3	**C3**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	
10.	Digital Modulation Schemes Frequency Shift Keying, Phase Shift Keying. (BPSK, QPSK etc)	CLO3	**C3**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	
11.	Digital Modulation Schemes Frequency Shift Keying, Phase Shift Keying. (BPSK, QPSK etc)	CLO3	**C3**	Develop and compare the functional blocks of coding/modulation and demodulation/decoding for analog and digital communication systems.	3 Hours	Assignment 1 Quiz 1
12.	Importance of Constellation Diagram, Eye Diagram and Trellis Diagram	CLO3	**C3**	Develop and compare the performance of binary, M-ary and spread spectrum digital communications in the presence of noise and interference. Design of linear systematic block coding and its error detection/correction capability is also discussed.	3 Hours	
13.	Basic Channel Models in Information Theory, Source Coding (Shannon Fanon Code	CLO4	**C3**	Develop and compare the performance of binary, M-ary and spread spectrum digital communications in the presence of noise and interference. Design of	3 Hours	Assignment 2 Quiz 2

				linear systematic block coding and its error detection/correction capability is also discussed.		
14.	Source Coding (Huffman Code)	CLO4	**C3**	Develop and compare the performance of binary, M-ary and spread spectrum digital communications in the presence of noise and interference. Design of linear systematic block coding and its error detection/correction capability is also discussed.	3 Hours	Assignment 3 Quiz 3
15.	Channel Coding and Basic Codes Block and Cyclic)	CLO4	**C3**	Develop and compare the performance of binary, M-ary and spread spectrum digital communications in the presence of noise and interference. Design of linear systematic block coding and its error detection/correction capability is also discussed.	3 Hours	
16.	Introduction to BCH and RS codes	CLO4	**C3**	Develop and compare the performance of binary, M-ary and spread spectrum digital communications in the presence of noise and interference. Design of linear systematic block coding and its error detection/correction capability is also discussed.	3 Hours	

- Every instructor have his/her plan for course material used for assignments and quizzes, table above is just a guideline.

18	Course Learning Outcomes (CLOs) and Assessment Plan

CLO / Activity	CLO 1	CLO2	CLO3	CLO4	*
Quiz 1					
Quiz 2					
Quiz 3					
Assignment 1					
Assignment 2					
Assignment 3					
MID TERM EXAM					
Quiz 1					
Quiz 2					
Quiz 3					
Assignment 1					
Assignment 2					
Assignment 3					
FINAL TERM EXAM					

20	Lab Details
Available in lab CDF	
Laboratory Resources	
• Software + Hardware based	
21	**Mapping of CLOs to PLOs**

PLO / CLOs	PLO1	PLO2	PLO3	PLO4	PLO5	PLO6	PLO7	PLO8	PLO9	PLO10	PLO11	PLO12
CLO1		C3										
CLO2		C3										
CLO3			C4									
CLO4				C4								

22	List of Experiment With Objectives as Per OBE Format

Lab	Title and Objectives	CLO_Lab	Taxonomy Level	PLO	Rubrics
1	Introduction to communication systems and Lab equipment.		C2,P2		
2	To examine the principle diagram of the operation of a transmitter and Receiver.		C2, P3		
3	To study the basic block diagram of Digital Communication Systems.		C4		
4	To study and implement the principles of Pulse Code Modulation (PCM) on MATLAB and communication module MCM 30/EV.		C2, P3		
5	To study and implement the principles of Differential Pulse Code Modulation (DPCM) on MATLAB and communication module MCM 30/EV.		C2, P4		
6	To study and implement the principles of Amplitude Shift Keying (ASK) on MATLAB and communication module MCM 30, 24/EV.		C2, P4		
7	To study and implement the principles of Phase Shift Keying (PSK) on MATLAB and communication module MCM 30, 24/EV.		C2, P4		
8	To study and implement the principles of Quadrature Phase Shift Keying (QPSK) on MATLAB using the importance of constellation diagram.		C2, P4		
9	To study and implement the principles of Quadrature Phase Shift Keying (PSK) on MATLAB using the importance of constellation diagram with Noise addition. Analysis.		C2, P6		
10	To study and implement the principles of Analog Modulation Scheme DSB, DSB-SC, SSB on MATLAB and communication module MCM 24/EV.		C2, P3		
11	Illustrate the importance of Super Heterodyne receiver and design a super heterodyne receiver in Simulink.		C2, P3		
12	Illustrate the importance of Phase Locked Loop (PLL) and design a super		C2, P3		

	heterodyne receiver in Simulink.				
13	Design of radio. Project Discussion session. (SOFTWARE DEFINED RADIO).		C2, P3		
14	Design of Digital Communication Systems in Simulink		C2, P3		
15	REVISION session				