COURSE HANDOUT

ANALOG AND DIGITAL COMMUNICATION (ECE-402)

ECE-4TH SEMESTER

ACADEMIC YEAR (2023-24)

Ms Gurpreet Raina

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Course Code	Course Name	Course Type	Cd	L	T	P	Marks		
							Sessional	Final Exam	Total
ECE-402	Analog and Digital Communication	Core	4	**3**	**1**	0	**50**	**100**	150

COURSE OUTCOMES

At the end of the course the student will be able to:	
CO1	Analyze the behavior of a communication system in presence of noise and compare different analog modulation schemes for their efficiency and bandwidth
CO2	Investigate pulsed modulation system and analyze their system performance
CO3	Analyze different digital modulation schemes and can compute the bit error performance
CO4	Describe different information coding techniques and compare the performance
CO5	Explain the concepts involved in optical fiber communication

Section-A

Unit 1: Continuous Wave Modulation: The essentials of communication systems, Noise in communication system, Signal to noise ratio & noise figure, Concept & need for modulation, Types of modulation, Amplitude Modulation and Demodulation, Generation of DSBSC waves, Coherent detection of DSBSC waves, Single side band modulation and demodulation, vestigial sideband modulation (VSB),Theory of FM, Representation & frequency spectrum of FM, Pre-Emphasis, De-Emphasis, Wide band & Narrow band FM, Generation & detection of FM signal, Comparison with PM & AM, Introduction to receivers, Super heterodyne receivers.

(17Hrs)

Unit 2: Pulse Modulation**:** Basic model of digital communication system, Sampling Process, Quantization Process, Pulse-Amplitude Modulation and Other forms of Pulse Modulation, Pulse-Code Modulation, Delta Modulation, Linear Prediction, Differential Pulse-Code Modulation and Adaptive Differential Pulse-Code Modulation, Time division multiplexing.

(11Hrs)

Unit3: Digital Modulation Techniques: Introduction to Digital Modulation Techniques, Types of digital modulation techniques, FSK, ASK, BPSK, DPSK, QPSK generation and reception, differentially encoded PSK (DEPSK), M-ray PSK, MSK, Comparison of digital modulation techniques.

(9Hrs)

Section-B

Unit 4: Information Theory and Channel Coding**:** Information rate, Entropy, source coding & coding efficiency, Shannon Fanno coding, Huffman coding, channel capacity theorem, Block codes coding and decoding, Soft and hard decision, Convolution coding and decoding, State & Trellis diagrams, Viterbi Algorithm.

(11Hrs)

Unit 5: Introduction to optical fiber communication: Nature of light, Advantages of Optical communication, Fiber Structures, Wave guiding, Basic optical laws and Definition, Optical fiber modes and Configuration, Mode theory for circular waveguides, Single mode fibers, Graded index fiber, Fiber materials and applications. **(8Hrs)**

Textbooks

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Principles of Communication Systems	Taub and Schilling	Tata McGraw Hill	3rd (2009)
2.	Communication Signals and Systems	S. Haykins	Wiley-India	3rd (2010)
3	Digital Communications: Fundamentals and Applications	Bernard Sklar	Prentice-Hall PTR	3rd (2017)

Reference Books

S.No	Name of the Books	Name of the Author	Publisher Name	Edition (Pub.Yr.)
1	Digital Communications	J.G. Proakis,	Prentice Hall	2nd (2002)
2	Communication Systems: Analog & Digital	RP Singh, S D Sapre	Tata McGraw Hill	2nd (2008)
3	Optical Fiber Communications	Gerd Keiser	Tata McGraw Hill	2nd (2008)
4	Electronic Communication Systems	George Kennedy, Bernard Davis, S. R. M Prasanna	McGraw Hill	6th (2017)

COURSE PLAN		
Unit-I Continuous Wave Modulation		
S.No	**Topics**	**Recommended Books**
1	The essentials of communication systems	Book 1, Ch.1
2	Noise in communication system	Book 1, Ch.7
3	Signal to noise ratio & noise figure	Book 1, Ch.7
4	Concept & need for modulation, Types of modulation	Book 2, Ch.3
5	Amplitude Modulation and Demodulation	Book 2, Ch.3
6	Generation of DSBSC waves	Book 2, Ch.3
7	Coherent detection of DSBSC waves	Book 2, Ch.3
8	Single side band modulation and demodulation	Book 2, Ch.3
9	Vestigial sideband modulation (VSB)	Book 2, Ch.3

10	Theory of FM, Representation & frequency spectrum of FM	Book 2, Ch.4
11	Pre-Emphasis, De-Emphasis, Wide band & Narrow band FM	Book 2, Ch.4
12	Generation & detection of FM signal	Book 2, Ch.4
13	Comparison with PM & AM	Book 2, Ch.4
14	Introduction to receivers, Super heterodyne receivers	Book 1, Ch.2
Unit-II Pulse Modulation		
15	Basic model of digital communication system & Sampling Process	Book 1, Ch.2
16	Quantization Process	Book 1, Ch.2
17	Pulse-Amplitude Modulation	Book 1, Ch.1
18	Other forms of Pulse Modulation	Book 2, Ch.2
19	Pulse-Code Modulation	Book 2, Ch.2
20	Delta Modulation	Book 2, Ch.2
21	Linear Prediction	Book 2, Ch.2
22	Differential Pulse-Code Modulation	Book 2, Ch.2
23	Adaptive Differential Pulse-Code Modulation	Book 2, Ch.2
Unit-III Digital Modulation Techniques		
24	Introduction to Digital Modulation Techniques	Book 3, Ch.4
25	Types of digital modulation techniques	Book 3, Ch.4
26	FSK generation and reception	Book 3, Ch.4
27	ASK generation and reception	Book 3, Ch.4
28	BPSK generation and reception	Book 3, Ch.4
29	DPSK generation and reception	Book 3, Ch.4
30	QPSK generation and reception	Book 3, Ch.4
31	Differentially encoded PSK (DEPSK)	Book 3, Ch.4
32	M-ray PSK	Book 3, Ch.4
33	MSK & Comparison of digital modulation techniques.	Book 3, Ch.4
Unit-IV Information Theory and Channel Coding		
34	Information rate	Book 2, Ch.3
35	Entropy	Book 1, Ch.4
36	source coding & coding efficiency	Book 1, Ch.4
37	Shannon Fanno coding	Book 2, Ch.3
38	Huffman coding	Book 1, Ch.3
39	channel capacity theorem	Book 2, Ch.3
40	Block codes coding and decoding	Book 1, Ch.3
41	Convolution coding and decoding	Book 1, Ch.3
42	State & Trellis diagrams and Viterbi Algorithm.	Book 1, Ch.3

Unit-V Introduction to optical fiber communication		
43	Nature of light & Advantages of Optical communication	Book 3 (Ref), Ch.1
44	Fiber Structures & Wave guiding	Book 3 (Ref), Ch.2
45	Basic optical laws and Definition	Book 3 (Ref), Ch.2
46	Optical fiber modes and Configuration	Book 3 (Ref), Ch.2
47	Mode theory for circular waveguides	Book 3 (Ref), Ch.2
48	Single mode fibers & Graded index fibers	Book 3 (Ref), Ch.2
49	Fiber materials and applications	Book 3 (Ref), Ch.2

ADDITIONAL WEB

1.	**NPTEL:** Video lectures on Analog Communication Lecture series by Prof. Gautam Das, IIT Kharagpur. https://nptel.ac.in/courses/117/105/117105143
2	**NPTEL:** Video lectures on Introduction on Digital communication lecture series by Prof. Bikash Kumar, IIT Bombay. https://nptel.ac.in/courses/117/101/117101051/
3	**NPTEL:** Video lectures on Introduction on Information theory and coding lecture series by Prof. S. N. Merchant, IIT Bombay. https://nptel.ac.in/courses/117/101/117101053/

GRADING AND ASSESSMENT

- **Sessional Test**: 20 marks
- **Assignment**: 20 marks
- **Attendance**: 10 marks
- **Final Examination**: 100 marks

COURSE POLICIES

- **Attendance**: Minimum 75% attendance is mandatory to appear in the final examination of the course.
- **Academic Integrity**: MIET's academic integrity policies apply. Plagiarism will not be tolerated.
- **Late Submissions**: Assignments and projects must be submitted by the specified timelines.

FACULTY INFORMATION

- **Office Hours**

Monday (12:05 PM - 12:55 PM)
Friday (12:05 PM - 12:55 PM)

- **Contact Information**

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