Department of Electronics and Communication Engineering

COURSE FILE

Sub: Analog and Digital communications **A.Y.2022-2023**

Year: II Year II Semester

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HOD **PRINCIPAL**

1. Vision & Mission of the Department:

Vision

To promote excellence in technical education and scientific research in electronics and communication engineering for the benefit of society.

Mission

- M1: To impart excellent technical education with state of art facilities inculcating values and lifelong learning attitude.
- M2: To develop core competence in our students imbibing professional ethics and team spirit.
- M3: To encourage research benefiting society through higher learning.

2. PEOs & POs

PEO

1. PEO 1: Establish themselves as successful professionals in their career and higher education in the field of Electronics & Communication Engineering and allied domains through rigorous quality education.
2. PEO 2: Develop Professionalism, Ethical values, Excellent Leadership qualities, Communication Skills and teamwork in their Professional front and adapt to current trends by engaging in lifelong learning
3. PEO 3: Apply the acquired knowledge & skills to develop novel technology and products for solving real life problems those are economically feasible and socially relevant
4. PEO 4: To prepare the graduates for developing administrative acumen, to adapt diversified and multidisciplinary platforms to compete globally

PSO

1. PSO1: Ability to apply concepts of Electronics & Communication Engineering to associated research areas of electronics, communication, signal processing, VLSI, embedded systems, IoT and allied technologies.
2. PSO2: Ability to design, analyze and simulate a variety of Electronics & Communication functional elements using hardware and software tools along with analytic skills.

POs

1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems
2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations**.**
6	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice**.**
7	**Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8	**Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10	**Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11	**Project management and finance:** Demonstrate knowledge and understanding

	of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. Mapping of course objectives, course out comes with PEOS and Pos

Course Outcomes:

Course Code.CO No	Course Outcomes (CO's)
At the end of the course student will be able to,	
CO1	Analyze and design of various continuous wave and angle modulation and demodulation techniques
CO2	Understand the effect of noise present in continuous wave and angle modulation techniques.
CO3	Attain the knowledge about AM , FM Transmitters and Receivers
CO4	Analyze and design the various Pulse Modulation Techniques
CO5	Understand the concepts of Digital Modulation Techniques and Baseband transmission.

CO-PO matrices:-

Course Outcomes	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2
CO1	3	3	3	3	3	3	2	2	1	1	1	3
CO2	3	3	3	3	3	1	1	1	-	-	1	2
CO3	3	3	3	3	3	2	2	1	-	-	2	3
CO4	3	2	3	2	3	2	-	1	-	-	2	2
CO5	3	3	3	3	3	2	2	1	-	-	2	3

4. SYLLABUS – CMREC Autonomous

Course Objectives:

- To develop ability to analyze system requirements of analog and digital communication systems.
- To understand the generation, detection of various analog and digital modulation techniques.
- To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
- To understand the concepts of baseband transmissions.

Course Outcomes: Upon completing this course, the student will be able to

- Analyze and design of various continuous wave and angle modulation and demodulation techniques
- Understand the effect of noise present in continuous wave and angle modulation techniques.
- Attain the knowledge about AM , FM Transmitters and Receivers
- Analyze and design the various Pulse Modulation Techniques.
- Understand the concepts of Digital Modulation Techniques and Baseband transmission.

UNIT - I Amplitude Modulation: Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

UNIT - II Angle Modulation: Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power,

Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

UNIT - III Transmitters: Classification of Transmitters, AM Transmitters, FM Transmitters Receivers: Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

UNIT - IV Pulse Modulation: Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM. Pulse Code Modulation: PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM

UNIT - V Digital Modulation Techniques: ASK- Modulator, Coherent ASK Detector, FSK- Modulator, NonCoherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM. Baseband Transmission and Optimal Reception of Digital Signal: A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

TEXTBOOKS:

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

REFERENCE BOOKS:

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, Goutam Saha, 3 rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean, 4th Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004
4. Analog and Digital Communication – K. Sam Shanmugam, Willey, 2005

4. **Individual Time Table**

Mr.S.SUDHAKAR **ADC - II ECE-A &B**

DAY/ TIME	9.10AM-10.10AM	10.10AM - 11.00AM	11.00AM - 11.50AM	11.50 to 12.40 PM	12.40 PM -1.20	1.00PM-1.50PM	2.00PM-2.50PM	3.10 to 4PM
MON	ADC-B LAB			ADC-B		ADC-A	ADC-A LAB	
TUE						ADC-B		ADC-A
WED								
THU			ADC-A			ADC-B	ADC-B LAB	
FRI	ADC-A LAB					ADC-A		ADC-B
SAT			ADC-A			ADC-B		

Mr.M RAJA **ADC- II ECE-C&D**

DAY/ TIME	9.10AM-10.10AM	10.10AM - 11.00AM	11.00AM - 11.50AM	11.50 to 12.40 PM	12.40 PM -1.20	1.00PM-1.50PM	2.00PM-2.50PM	3.10 to 4PM
MON			ADC-D LAB			ADC-C		ADC-D
TUE	ADC-D LAB					ADC-C		ADC-D
WED								
THU			ADC-C LAB			ADC-D		ADC-C
FRI		ADC-C		ADC-D			ADC-C LAB	
SAT	ADC-C		ADC-D					

6.SESSION PLAN (attached) & Detailed Lecture Plan

Analog and Digital Communication (Lesson) Plan

Subject code	Name of the subject	Year/Branch	Name of the Faculty
	Analog and Digital Communications	II B.Tech II Sem ECE	Dr.S.Poongodi

Name of the Topic	Subtopics	No. of classes	Text books	Methodology	Remarks
UNIT-1 Amplitude Modulation	Introduction to communication and Need for Modulation	L1	T1,T2,R1, R3	M1	
	Amplitude modulation, Definition	L2	T1,T2,R1, R3	M1	
	Time domain and Frequency domain description	L3	T1,T2,R1, R3	M1	
	Power relations in AM waves	L4	T1,T2,R1, R3	M1	
	Generation of AM waves Square law Modulator,	L5	T1,T2,R1, R3	M1&M5	
	Generation of AM waves: Switching Modulator	L6	T1,T2,R1, R3	M1	
	Detection of AM Waves: Square law detector, envelope detector	L7	T1,T2,R1, R3	M1&M5	
	Double side band suppressed carrier modulators	L8	T1,T2,R1, R3	M1	
	Time domain and frequency domain	L9	T1,T2,R1, R3	M1	
	Generation of DSBSC waves: Balanced	L10	T1,T2,R1, R3	M1&M5	

	Modulator, Ring Modulator				
	Coherent detection of DSB-SC Modulated waves, COSTAS Loop	L11	T1,T2,R1, R3	M1	
	SSB modulation –Time and Frequency domain Description	L12	T1,T2,R1, R3	M1	
	Frequency discrimination and Phase discrimination methods for generating SSB	L13	T1,T2,R1, R3	M1&M7	
	Demodulation of SSB Waves, **Principle of Vestigial side band modulation**	L14	T1,T2,R1, R3	M1	
	TOTAL NO OF CLASSES = 14				
UNIT II:Angle Modulation	Basic concepts of Phase and Frequency Modulation	L15	T1,T2,R1, R3	M1, M2	
	Frequency Modulation: Single tone frequency modulation	L16	T1,T2,R1, R3	M1, M2	
	Spectrum Analysis of sinusoidal FM Wave	L17	T1,T2,R1, R3	M1, M2	
	Narrow band FM, Wide band FM	L18	T1,T2,R1, R3	M1, M2	
	Constant Average Power, Transmission bandwidth of FM Wave	L19	T1,T2,R1, R3	M1, M2	
	Comparison of FM and AM	L20	T1,T2,R1, R3	M1, M2	
	Generation of FM Wave using Armstrong method	L21	T1,T2,R1, R3	M1	
	Detection of FM Waves: i)Balanced slope detector	L22	T1,T2,R1, R3	M1&M5	

	ii)Phase locked loop	L23	T1,T2,R1, R3	M1&M5	
	Concept of Pre-emphasis & de-emphasis	L24	T1,T2,R1, R3	M1	
	TOTAL NO OF CLASSES = 10				
UNIT - III Transmitters	Classification of Transmitters	L25	T2, R1,R3	M1	
	AM Transmitters	L26	T1,T2,R1, R3	M1	
	FM Transmitters	L27	T1,T2,R1, R3	M1	
	Tuned radio frequency receiver	L28	T2, R1,R2	M1	
	Superhetrodyne receiver	L29	T2, R1,R3	M1	
	RF section and Characteristics	L30	T2, R1,R3	M1	
	Frequency changing and tracking	L31	T2, R1,R3	M1	
	Intermediate frequency, AGC	L32	T2, R1,R3	M1&M5	
	FM Receiver, Comparison with AM Receiver	L33,34	T2,R1,R3	M1	
	Amplitude limiting	L35	T2,R1,R3	M1	
	TOTAL NO OF CLASSES=11				
UNIT IV: Pulse Modulation	Types of Pulse Modulation	L36	T1,R4	M1	
	PAM(single polarity, double polarity)	L37	T1,R4	M1&M5	
	PWM: Generation & demodulation of PWM	L38	T1,R4	M1&M5	
	PPM: Generation & demodulation of PPM	L39	T1,R4	M1&M5	
	Comparison of FDM and TDM	L40	T1,R4	M1	
	Pulse Code Modulation:	L41	T1,R4	M1&M5	

	PCM Generation and Reconstruction,				
	Quantization Noise in PCM	L42	T1,R4	M1	
	Non-Uniform Quantization and Companding,	L43	T1,R4	M1	
	DPCM	L44	T1,R4	M1&M5	
	Adaptive DPCM	L45	T1,R4	M1&M5	
	DM and Adaptive DM	L46	T1,R4	M1&M5	
	Noise in PCM and DM	L47	T1,R4	M1	
TOTAL NO OF CLASSES = 12					
UNIT-V Digital Modulation Techniques	ASK- Modulator, Coherent ASK Detector	L48, L49	T1,R4	M1&M5	
	FSK- Modulator, NonCoherent FSK Detector,	L50, L51	T1,R4	M1&M5	
	BPSK- Modulator, Coherent BPSK Detection	L52, L53	T1,R4	M1&M5	
	Principles of QPSK	L54	T1,R4	M1	
	Differential PSK	L55	T1,R4	M1	
	QAM	L56,L 57	T1,R4	M1	
	A Baseband Signal Receiver,	L58	T1,R4	M1	
	Probability of Error, Optimum Receiver, Coherent Reception,	L59	T1,R4	M1	
	ISI, Eye Diagrams	L60	T1, R4	M1	
	TOTAL NO OF CLASSES =13				
TOTAL NO OF CLASSES=60					

7. **Detailed lecture plan**

Subject code	Name of the subject	Year/Branch	Name of the Faculty
EC402PC	Analog and Digital Communications	II B.Tech II Sem ECE	Mr.S.SUDHAKAR

S.No.	Topic (CMREC Autonomous Syllabus)	Subtopics	No. Lectures Required	Suggested books	Remarks
UNIT – I					
1.	Introduction to communication and Need for Modulation	Introduction to communication and Need for Modulation	L1	T1,T2,R1, R3	
2.	Amplitude modulation, Definition	Amplitude modulation, Definition and waveforms	L2	T1,T2,R1, R3	
3.	Time domain and Frequency domain description	Time domain and Frequency domain description	L3	T1,T2,R1, R3	
4.	Power relations in AM waves	Power relations in AM waves	L4	T1,T2,R1, R3	
5.	Generation of AM waves Square law Modulator,	Generation of AM waves Square law Modulator,	L5	T1,T2,R1, R3	
6.	Generation of AM waves: Switching Modulator	Generation of AM waves: Switching Modulator	L6	T1,T2,R1, R3	
7.	Detection of AM Waves: Square law detector, envelope detector	Detection of AM Waves: Square law detector, envelope detector, Problems	L7	T1,T2,R1, R3	
8.	Double side band suppressed carrier modulators	Double side band suppressed carrier modulators, Problems	L8	T1,T2,R1, R3	
9.	Time domain and frequency domain	Time domain and frequency domain description	L9	T1,T2,R1, R3	
10.	Generation of DSBSC waves: Balanced Modulator, Ring Modulator	Generation of DSBSC waves: Balanced Modulator, Ring Modulator, Problems	L10	T1,T2,R1, R3	
11.	Coherent detection of DSB-SC Modulated waves, COSTAS Loop	Coherent detection of DSB-SC Modulated waves, COSTAS Loop, Problems	L11	T1,T2,R1, R3	
12.	SSB modulation –Time and Frequency domain	SSB modulation –Time and Frequency domain	L12	T1,T2,R1, R3	

	Description	Description,Problems			
13.	Frequency discrimination and Phase discrimination methods for generating SSB	Frequency discrimination and Phase discrimination methods for generating SSB	L13	T1,T2,R1, R3	
14.	Demodulation of SSB Waves, Principle of Vestigial side band modulation	Demodulation of SSB Waves, Principle of Vestigial side band modulation	L14	T1,T2,R1, R3	
	UNIT - II				
15.	Basic concepts of Phase and Frequency Modulation	Introduction, Basic concepts of Phase and Frequency Modulation	L15	T1,T2,R1, R3	
16.	Frequency Modulation: Single tone frequency modulation	Frequency Modulation: Single tone frequency modulation Derivation and Definition of NBFM and WBFM	L16	T1,T2,R1, R3	
17.	Spectrum Analysis of sinusoidal FM Wave	Spectrum Analysis of sinusoidal FM Wave	L17	T1,T2,R1, R3	
18.	Narrow band FM, Wide band FM	Narrow band FM, Wide band FM , Problems	L18	T1,T2,R1, R3	
19.	Constant Average Power, Transmission bandwidth of FM Wave	Constant Average Power, Transmission bandwidth of FM Wave,Problems	L19	T1,T2,R1, R3	
20.	Comparison of FM and AM	Comparison of FM and AM, Problems	L20	T1,T2,R1, R3	
21.	Generation of FM Wave using Armstrong method	Generation of FM Wave using Armstrong method	L21	T1,T2,R1, R3	
22.	Detection of FM Waves: i)Balanced slope detector	Detection of FM Waves: i)Balanced slope detector	L22	T1,T2,R1, R3	
23.	ii)Phase locked loop	ii)Phase locked loop – Linearised model	L23	T1,T2,R1, R3	
24.	Concept of Pre-emphasis & de-emphasis	Concept of Pre-emphasis & de-emphasis	L24	T1,T2,R1, R3	
	UNIT - III				
25.	Classification of Transmitters	Introduction, Classification of Transmitters	L25	T2, R1,R3	
26.	AM Transmitters	AM Transmitters	L26	T1,T2,R1, R3	
27.	FM Transmitters	FM Transmitters	L27	T1,T2,R1, R3	
28.	Tuned radio frequency receiver	Tuned radio frequency receiver functions and characteristics of Receiver	L28	T2, R1,R2, R3R1,R3	

29.	Superhetrodyne receiver	Superhetrodyne receiver	L29	T2, R1,R3	
30.	RF section and Characteristics	RF section and Characteristics	L30	T2, R1,R3	
31.	Frequency changing and tracking	Frequency changing and tracking	L31	T2, R1,R3	
32.	Intermediate frequency, AGC	Intermediate frequency, AGC	L32	T2, R1,R3	
33.	FM Receiver, Comparison with AM Receiver	FM Receiver, Comparison with AM Receiver	L33,34	T2,R1,R3	
34.	Amplitude limiting	Amplitude limiting	L35	T2,R1,R3	
UNIT - V					
35.	Types of Pulse Modulation	Types of Pulse Modulation	L36	T1,R4	
36.	PAM(single polarity, double polarity)	PAM(single polarity, double polarity)	L37	T1,R4	
37.	PWM: Generation & demodulation of PWM	PWM: Generation & demodulation of PWM	L38	T1,R4	
38.	PPM: Generation & demodulation of PPM	PPM: Generation & demodulation of PPM	L39	T1,R4	
39.	Comparison of FDM and TDM	Comparison of FDM and TDM	L40	T1,R4	
40.	Pulse Code Modulation: PCM Generation and Reconstruction,	Pulse Code Modulation: PCM Generation and Reconstruction, Problems	L41	T1,R4	
41.	Quantization Noise in PCM	Quantization Noise in PCM, Problems	L42	T1,R4	
42.	Non-Uniform Quantization and Companding,	Non-Uniform Quantization and Companding,	L43	T1,R4	
43.	DPCM	DPCM, Problems	L44	T1,R4	
44.	Adaptive DPCM	Adaptive DPCM	L45	T1,R4	
45.	DM and Adaptive DM	DM and Adaptive DM	L46	T1,R4	
46.	Noise in PCM and DM	Noise in PCM and DM	L47	T1,R4	
UNIT - IV					
47.	ASK- Modulator, Coherent ASK Detector	ASK- Modulator, Coherent ASK Detector, Problems	L48, L49	T1,R4	
48.	FSK- Modulator, NonCoherent FSK Detector,	FSK- Modulator, Non Coherent FSK Detector, Problems	L50, L51	T1,R4	
49.	BPSK- Modulator, Coherent BPSK Detection	BPSK- Modulator, Coherent BPSK Detection	L52, L53	T1,R4	
50.	Principles of QPSK	Principles of QPSK	L54	T1,R4	

51.	Differential PSK	Differential PSK, Problems	L55	T1,R4	
52.	QAM	QAM, Problems	L56,L57	T1,R4	
53.	A Baseband Signal Receiver,	A Baseband Signal Receiver,	L58	T1,R4	
54.	Probability of Error, Optimum Receiver, Coherent Reception,	Probability of Error, Optimum Receiver, Coherent Reception,	L59	T1,R4	
55.	ISI, Eye Diagrams	ISI, Eye Diagrams	L60	T1, R4	

8. Session Execution Log:

Sl.no	Syllabus	Scheduled completed date	Completed date	Remarks
1	I-UNIT	**06/03/2023**	**20/04/2023**	Completed
2	II-UNIT	**21/04/2023**	**13/05/2023**	Completed
3	III-UNIT	**05/06/2023**	**20/06/2023**	Completed
4	IV-UNIT	**22/06/2023**	**07/07/2023**	Completed
5	V-UNIT	**08/07/2023**	**15/07/2023**	Completed

9. ASSIGNMENT QUESTIONS

SUB: Analog and Digital Communications BRANCH: R20-B.Tech-ECE YEAR/SEM: II-II A.Y:2022-23

I-Mid ASSIGNMENT QUESTIONS

1. Explain the generation of AM wave with the help of block diagram?
   a) Square Law Modulator b) Ring Modulator **CO.1 [BTL-2]**

2. Explain the demodulation of DSB-SC wave with the help of block diagram?
   a) Costas loop method b) Coherent Detection **CO.1 [BTL-2]**

3. Explain the generation of SSB-SC signal by using
   a) Phase Discrimination method b) Frequency Discrimination method **CO.1 [BTL-2]**

4. a)Explain the generation of VSB signal and derive the expression for the VSB signal in time domain and frequency domain? **CO.1[BTL-2]**

   b) Derive the all parameters of the AM wave. (P_{LSB},P_{USB},B.W, P_T, I_T ,I_C, P_C, μ, η %,)
   CO.1 [BTL-2]

5. a) With the help of block diagram explain generation of NBFM signal using Armstrong method?
   CO.2 [BTL-3]

   b) Explain the demodulation of FM signal with the help of PLL? **CO.2 [BTL-1]**

SUB: Analog and Digital Communications BRANCH: R20-B.Tech-ECE YEAR/SEM: II-II A.Y:2022-23

II-MID ASSIGNMENT QUESTIONS

SET-1

1. Draw the block diagram of Superheterodyne FM receiver and explain each block, briefly.
2. Draw the block diagram of AM Low Level Transmitter and explain each block, briefly
3. Describe the generation and demodulation of PAM with the help of block diagram.
4. Explain about the generation of PCM with suitable diagrams.
5. Draw the block diagram of BASK Modulation and demodulation.

SET-II

1. Draw the block diagram of AM High Level Transmitter and explain each block, briefly.
2. Define Sensitivity, Selectivity, fidelity, Image frequency and Image frequency rejection ratio 3.Describe the generation and demodulation of PWM with the help of block diagram.
4. Explain about the generation of DPCM with suitable diagrams.
5. Draw the block diagram of BPSK Modulation and demodulation.

SET-III

1. Draw the block diagram of Indirect Modulated FM Transmitter and explain each block, briefly.
2. Draw the block diagram of TRF receiver and the function of each block.
3. Describe the generation and demodulation of PPM with the help of block diagram.
4. Explain about the generation of DM with suitable diagrams.
5. Draw the block diagram of BFSK Modulation and demodulation.

10. Sample assignment Script

(Attached Separately)

11. Unit-wise course material

Question Bank

UNIT I

Descriptive questions

1. Define modulation. Why is modulation required? What are the various types of modulations?
2. Explain Amplitude modulation with spectrum? Show that a nonlinear device can be used for generating AM signal. What are its limitations?
3. What is modulation index? What is envelope distortion?
4. Explain the generation of AM wave using a) square law modulator b)switching modulator
5. Explain the detection of AM wave using a) square law detector b)envelope detector
7. What is frequency translation?
8. Derive Pt=Pc□ (1+ma2/2)?
9. Compare Square law detector with envelope detector?
10. Distinguish between envelope detection and synchronous detection?
11. Explain SSB Modulation with its Spectral characteristics?
12. What are the Advantages of SSB systems?
13. How to Generate SSB using a) filter method & b) Phase shift method?
14. Explain Demodulation of SSB wave using Coherent detection?
15. Explain the Effects of frequency and phase errors in synchronous detection-DSB-SC, SSB-SC cases?
16. Compare different AM systems?
17. Explain VSB: generation, spectra and demodulation?
18. List Application of different AM systems?

UNIT II

1. What is Angle modulation? What are different types of Angle modulation?
2. Define PM & FM? What is frequency deviation & phase deviation?
3. Generate PM wave from FM ?
4. Generate PM wave from FM ?
5. Derive the equations for FM & PM waves?
6. Explain the spectrum of FM wave?
7. What is Carson's Rule?
8. What is the difference between wideband FM & Narrowband FM?

9. What is deviation ratio?
10. Plot FM wave taking modulating wave m(t) as a. Sine wave b. Square wave
11. Explain the Spectrum of Sinusoidal FM wave?
12. Explain the Phasor diagram of FM signals?
13. What are Advantages & Applications of FM?
14. Compare AM and FM?
15. What are the various methods of generating an FM wave?
16. Explain Detection of FM wave (both direct method and indirect method?
17. What is stereo Frequency multiplication?
18. What is FM demodulation?
19. Compare different types of FM demodulators?
20. Why limiting is necessary in FM demodulators? (Importance of pre emphasis And De emphasis)

UNIT III

Transmitters

1. Describe in detail about FM transmitter
2. Describe in detail about AM transmitter
3. Explain Tuned Radio Frequency receivers
4. Write short notes on Super heterodyne receiver
5. Explain Frequency changing and Tracking
6. Short notes on a) Intermediate frequency b) AGC c)Image Frequency d)Amplitude limiting
7. Explain FM Receiver
8. Comparison of AM and FM Receivers

UNIT-IV

Pulse Modulation

1. What is Delta modulation and compare with PCM?
2. Discuss different types of noise effects in delta modulation.
3. Describe the generation and detection of PCM.
4. Derive an expression for quantization noise in Delta modulation.
5. What is Companding? Explain how Companding improves the SNR of a PCM system?
6. The input of a PCM and a Delta Modulation(DM) is a sine wave of 4KHz. PCM and DM are both designed to yield an output SNR of 30dB. Assuming PCM

sampling at 5 times the Nyquist rate. Compare the bandwidth required for each system.

7. What is hunting in delta modulation? Explain.
8. A signal band limited within 3.6 KHz is to be transmitted via binary PCM on a channel whose maximum pulse rate is 40,000 pulses/sec. Design a PCM system and draw a block diagram showing all parameters.
10. Describe in detail about the types of pulse modulation PAM, PWM,PPM
11. Generation and Demodulation of PWM, PPM
12. Generation and Demodulation of PAM
13. Mention the impact of Quantization noise and non uniform quantization noise in PCM

UNIT V

Digital Modulation Techniques .

1. Draw and explain the ASK generation and detection method.

2. Draw QPSK block diagram and explain its working?

3. Derive probability of error for PSK,ASK,FSK?

4 .Explain the operation of DPSK?

5. Derive expression for band width and spectrum of FSK?

6. The bit stream 1011100011 is to be transmitted by DPSK. Determine the encoded sequence and transmitted phase sequence?

7. Elaborate in detail about the working principles of QAM.

8. Mention the importance of base band signal receiver.

9 Compare ASK,PSK,FSK,DPSK & QPSK?

10. Explain in detail about the following

i) Optimum receiver (ii) Coherent Reception (iii)ISI (iv) Eye Diagram

11. What are the advantages and disadvantages of digital modulation schemes?

11. Unit Wise Subject Materials

(Attached Separately)


ADC complete notes.zip


turorials.zip

12. Mid- I exam question paper

CMR ENGINEERING COLLEGE
UGC AUTONOMOUS
(Approved by AICTE - New Delhi. Affiliated to JNTUH and Accredited by NAAC & NBA)
Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II.B.TECH- II-SEM -I MID EXAMINATIONS, Date: 09-05-2023 Time: 10:00 AM TO 11:30 AM

Subject: ANALOG AND DIGITAL COMMUNICATIONS Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (21/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

PART A **5 x2=10**

6. Define modulation and explain the need for modulation? **CO.1 [BTL-1]**
7. A radio transmitter radiates 10 kW and carrier power is 8.5 kW .Calculate AM modulation index? **CO.1 [BTL-5]**
8. Draw the circuit diagram of balanced ring Modulator for generating DSB-SC modulated wave? **CO.1 [BTL-6]**
9. Compare frequency Modulation and phase Modulation**?** **CO.2 [BTL-2]**
10. Explain how phase modulated wave is generated? **CO.2 [BTL-3]**

PART B **3 x5=15**

11. An AM signal is generated by modulating the carrier $f_c = 800\ k\ Hz$ by the signal $m(t) = \sin(200\ \pi t) + 5\cos(4000\ \pi t)$ .The AM signal $s(t) = 100[1 + m(t)]cos(2\pi f_c t)$ is fed in to a $50\ \Omega$ load.

    a) Determine AM signal and sketch it's spectrum?
    b) Calculate the average power of the carrier in the sidebands?
    c) Find the modulation index?
    d) Find the peak power delivered to the load? **CO.1 [BTL-4]**

(OR)

12. Explain the detection of DSB-SC wave using costas loop with the help of block diagram? **CO.1 [BTL-2]**

13. Explain the generation of SSB-SC signal by using Phase Discrimination method? **CO.1 [BTL-2]**

(OR)

14. Explain the generation of VSB signal and derive the expression for the VSB signal in time domain and frequency domain? **CO.1 [BTL-2]**

(OR)

15. With the help of block diagram explain generation of NBFM signal using Armstrong method? **CO.2 [BTL-3]**

(OR)

16. Explain the demodulation of FM signal with the help of PLL? **CO.2 [BTL-1]**

SCHEME OF EVALUATION

Branch:ECE **Subject: ADC**
Year: II-II-I-Mid **Date: 09-05-2023**
Total marks: 25M **Time: 10 A.M To 11:30 A.M**

Scheme of Evaluation

S.NO	THEORY	MARKS	TOTAL
PART-A			
1	For writing Definition of modulation	1	2 Marks
	For explain the Need for Modulation	1	
2	For writing Formula for AM modulation index	1	2 Marks
	For finding modulation index		
3	For neat sketch of ring modulator	2	2 Marks
4	For writing at least 4 comparisons for both FM and PM	2	2 Marks
5	For Block diagram PM wave generation	1	2 Marks
	For Expression of PM	1	
	PART-B		
6	For Determining AM signal and sketch it's spectrum	2	5 Marks
	For Calculating the average power of the carrier in the sidebands?	1	
	For Finding the modulation index?	1	
	For Finding the peak power delivered to the load?	1	
7	For drawing Block diagram of costas loop	3	5 Marks
	For writing expressions of costas loop	2	
8	For drawing Block diagram of SSB-SC wave generation	3	5 Marks
	For writing expressions of phase discrimination	2	
9	For drawing Block diagram of VSB wave generation	3	5 Marks
	For deriving VSB time and frequency expressions .	2	
10	For drawing Block diagram of Armstrong method to generate NBFM wave	3	5 Marks
	For explanation of block diagram with proper expressions	2	
11	For drawing block diagram of FM demodulation	3	5 Marks
	For writing operation of PLL	2	

MID-II

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II.B.TECH- II-SEM -II MID EXAMINATIONS, Date: 25-07-2023 Time: 10:00 AM TO 11:30 AM

Subject: ANALOG AND DIGITAL COMMUNICATIONS Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (21/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

SET-I

PART A **5 x2=10**

17. What is AGC control and write its function? **CO.3 [BTL-1]**
18. Compare AM and FM Receivers? **CO.3 [BTL-2]**
19. Define Companding? **CO.4 [BTL-1]**
20. Distinguish in between TDM and FDM**?** **CO.4 [BTL-4]**
21. Write short notes on EYE diagram? **CO.5 [BTL-1]**

PART B **3 x5=15**

22. Draw the block diagram of AM High Level Transmitter and explain each block briefly? **CO.3 [BTL-3]**

(OR)

23. Define Sensitivity, Selectivity, fidelity, Image frequency and Image frequency rejection? **CO.3 [BTL-2]**
24. Describe the generation and demodulation of PWM with the help of block diagram? **CO.4 [BTL-3]**

(OR)

25. Explain about the generation of DPCM with suitable diagrams? **CO.4 [BTL-3]**
26. Draw the block diagram of BPSK Modulation and demodulation? **CO.5 [BTL-3]**

(OR)

27. Explain the non coherent detection of BFSK signal? **CO.5 [BTL-2]**

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II.B.TECH- II-SEM -II MID EXAMINATIONS, Date: 25-07-2023 Time: 10:00 AM TO 11:30 AM

Subject: ANALOG AND DIGITAL COMMUNICATIONS Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (21/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

SET-II

PART A **5 x2=10**

1. What is amplitude limitter and draw its circuit diagram? **CO.3 [BTL-1]**
2. Define Mixer and explain its operation? **CO.3 [BTL-2]**
3. Compare PAM, PWM, PPM? **CO.4 [BTL-2]**
4. Explain the quantizer operation**?** **CO.4 [BTL-2]**
5. Write short notes on ISI? **CO.5 [BTL-1]**

PART B **3 x5=15**

6. Draw the block diagram of Superheterodyne FM receiver and explain each block briefly? **CO.3 [BTL-3]**

(OR)

7. The RF local oscillator and IF frequencies of an AM receiver are 800kHz ,1255kHz and 455 kHz respectively(Q=120)

i. Determine image frequency?
ii. Determine Image frequency rejection ratio?

CO.3 [BTL-5]

8. Draw the block diagram of AM Low Level transmitter and explain each block briefly? **CO.4 [BTL-3]**

(OR)

9. Describe the generation and demodulation of PAM with the help of block diagram? **CO.4 [BTL-2]**

10. Explain about the generation of PCM with suitable diagrams? **CO.4 [BTL-3]**

(OR)

11. Draw the block diagram of BASK modulation and demodulation? **CO.5 [BTL-3]**

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Kandlakoya (V), Medchal (M), Medchal - Malkajgiri (D)-501401

II.B.TECH- II-SEM -II MID EXAMINATIONS, Date: 25-07-2023 Time: 10:00 AM TO 11:30 AM

Subject: ANALOG AND DIGITAL COMMUNICATIONS Branch: ECE Marks: 25 M

Note: Question paper contains two parts, Part - A and Part - B.

Part-A is compulsory which carries 10 marks. Answer all questions in part-A.

Part-B consists of (21/2) units. Answer any one full question from each unit. Each question carries 5 marks and may have a, b, c sub questions.

SET-III

PART A **5 x2=10**

1. Sate the difference between AM and FM transmitter? **CO.3 [BTL-1]**
2. Write short notes on tracking methods in superheterodyne receiver? **CO.3 [BTL-2]**
3. What is single polarity and double polarity in PAM? **CO.4 [BTL-2]**
4. Draw the block diagram of Adaptive Delta modulation transmitter and receiver**?** **CO.4 [BTL-3]**
5. State the advantages and disadvantages of QPSK? **CO.5 [BTL-1]**

PART B **3 x5=15**

6. Draw the block diagram of Indirect Modulated FM Transmitter and explain each block briefly? **CO.3 [BTL-3]**

(OR)

7. Draw the block diagram of TRF receiver and the function of each block. ? **CO.3 [BTL-3]**
8. Describe the generation and demodulation of PPM with the help of block diagram. **CO.4 [BTL-4]**

(OR)

9. Explain about the generation of DM with suitable diagrams? **CO.4 [BTL-3]**
10. Discuss different type of noise effects in delta modulation? **CO.4 [BTL-3]**

(OR)

11. Draw the block diagram of BFSK Modulation and demodulation? **CO.5 [BTL-3]**

Scheme of Evaluation

PART A **5 x2=10**

1 . Definition of amplitude limitter (1M), circuit diagram (1M)

2 . Define Mixer (1M) ,Its operation (1M)

3 . Compare PAM, (0.5M), PWM, (0.5M) and PPM (1M)

4 . Explanation of quantizer (2M)

5 .Definition of ISI (1M) Short notes (1M)

PART B **3 x5=15**

6. Draw the block diagram of Superheterodyne FM receiver and explain each block briefly?

Block diagram(2M), Processing Explanation for each block(3M)

7. The RF local oscillator and IF frequencies of an AM receiver are 800kHz ,1255kHz and 455 kHz respectively(Q=120)

i)Determine image frequency?

ii)Determine Image frequency rejection ratio?

Determine image frequency (2M), Determine Image frequency rejection ratio (3M)

8. Draw the block diagram of AM Low Level transmitter and explain each block briefly?

Block diagram (2M), Processing Explanation for each block (3M)

9. Describe the generation and demodulation of PAM with the help of block diagram?

Block diagram (2M), Explanation for generation and demodulation (3M)

10. Explain about the generation of PCM with suitable diagrams? .

Draw block diagram (2M),Processing Explanation for all blocks(3M)

11. Draw the block diagram of BASK modulation and demodulation?

Draw block diagram for each(2M),Processing Explanation for all blocks(3M)

13. Sample Mid Answer Scripts

14. Material Collected from Internet/Wed sites

https://beng2413.files.wordpress.com/2009/01/chapter-5.ppt

https://www.javatpoint.com/analog-communication

https://www.geeksforgeeks.org/difference-between-analog-communication-and-digital-communication/

books.zip

24. Power Point Presentations

ADC PPT.zip

25. Previous Question paper model

R16

Code No: 134AC

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, November/December - 2020
ANALOG COMMUNICATIONS
(Common to ECE, ETM)

Time: 2 Hours **Max. Marks: 75**

Answer any Five Questions
All Questions Carry Equal Marks
- - -

1. State and derive Power equation for various AM techniques. [15]

2.a) Express the DSB-SC both in time-domain and frequency domain and then explain the same.
b) What is meant by single tone modulation? Elaborate. [10+5]

3. Derive the equation for VSB and explain it with neat block diagram. [15]

4.a) Explain SSB generation using phasing method.
b) Compare different AM Techniques. [10+5]

5.a) Derive and explain the Bessel function for FM.
b) Compare Direct and Indirect method of FM generation. [10+5]

6.a) State the Non linear effects of FM.
b) The maximum frequency deviation is 10 kHz and signal frequency is 10 kHz. Find bandwidth using Carson's rule and Modulation index. [9+6]

7.a) Explain Pre-Emphasis and de-emphasis in detail.
b) Explain SNR enhancement for FM method using a numerical Example. [7+8]

8.a) With neat diagram explain super heterodyne receiver in detail.
b) Compare various pulse modulation techniques. [8+7]

---ooOoo---

Code No: 134AC

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, May - 2019
ANALOG COMMUNICATIONS
(Common to ECE, ETM)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) A modulating signal consists of a symmetrical triangular wave, which has zero dc component and peak-to-peak voltage 11v. It is used to amplitude modulate a carrier of peak voltage 10v. Find the modulation index? [2]

b) The antenna current of an AM transmitter is 8 Amps, when only the carrier is sent, but it increases to 8.93A, when the carrier is modulated by a single sine wave. Find percentage modulation. Determine the antenna current when the percent modulation changes to 0.8. [3]

c) List the properties of Hilbert Transform. [2]

d) Illustrate the block diagram for the detection of SSB-SC signal using phase discrimination method. [3]

e) Define modulation index and bandwidth of FM. [2]

f) Compare NBFM and WBFM. [3]

g) What is meant by Noise? State the different types of Noise. [2]

h) Explain how noise can be calculated in a communication system. [3]

i) Define sensitivity and selectivity. [2]

j) Explain the image frequency rejection of a radio receiver. [3]

PART-B

(50 Marks)

2. Develop the equation of a single tone modulation of AM system and Also power relations. [10]

OR

3. Explain the principle of operation of Envelope detector used for AM detection, with necessary equations. [10]

4. Explain the phase discrimination method for generating SSB signal. [10]

OR

5. Why VSB modulation is used in TV broad casting? Give the VSB filter characteristics with spectrum. [10]

6. What are the different demodulation techniques of FM? Explain the demodulation of F.M signal with the help of PLL. [10]

OR

7. Formulate the equation for FM wave. Define modulation index, maximum deviation and band width of a FM signal. [10]

8. Explain about the noise performance of an FM receiver. [10]

OR

9. Explain the noise performance of SSB-SC receiver and prove its S/N ratio is unity. [10]

10. Draw the block diagram of Superhetrodyne receiver and explain the function of each block. [10]

OR

11.a) Explain, how a PPM signal can be generated from PWM signal?
b) Compare PAM, PWM and PPM pulse modulation techniques. [5+5]

---ooOoo---

Code No: 134AC

R16

JAWAHARLAL NEHRU TECHNOLOGICAL UNIVERSITY HYDERABAD
B.Tech II Year II Semester Examinations, December - 2018
ANALOG COMMUNICATIONS
(Electronics and Communication Engineering)

Time: 3 Hours **Max. Marks: 75**

Note: This question paper contains two parts A and B.
Part A is compulsory which carries 25 marks. Answer all questions in Part A.
Part B consists of 5 Units. Answer any one full question from each unit. Each question carries 10 marks and may have a, b, c as sub questions.

PART- A

(25 Marks)

1.a) Define analog Modulation and also, list different types of analog modulations. [2]
b) Define Modulating Signal, Carrier and Modulated Signals. [3]
c) What is Guard band? [2]
d) Compare SSB and VSB. [3]
e) List the disadvantages of FM over AM. [2]
f) In an FM system, if m_f is doubled by halving the modulating frequency, what will be the effect on the maximum deviation? [3]
g) What is threshold effect? [2]
h) What is pre-emphasis? Why is it used? [3]
i) Illustrate Single and double polarity PAM wave. [2]
j) Define Sensitivity, Selectivity and image frequency. [3]

PART-B

(50 Marks)

2.a) With the help of waveforms and spectrum, describe the concept of Amplitude modulation both in time domain and frequency domain.
b) Describe the coherent detection of DSB-SB modulated waves. [5+5]

OR

3.a) With necessary circuit diagram and waveforms, explain how DSB-SC wave is generated using:
i) Balance Modulators and
ii) Ring Modulator.
b) When a broadcast AM transmitter is 50 percent modulated, its antenna current is 12 A. What will be current when the modulation depth is increased to 0.9? [8+2]

4. Describe the SSB in frequency domain and then explain how to generate SSB modulated wave using frequency discrimination method. Also, list the advantages of SSB. [10]

OR

5.a) Describe the VSB in time domain and then explain any one method of generating VSB modulated wave.
b) Give the applications of AM-FC and VSB modulation schemes. [6+4]

6. What are the different demodulation techniques of FM? Explain the demodulation of F.M signal with the help of PLL. [10]

OR

7. Formulate the equation for FM wave. Define modulation index, maximum deviation and band width of a FM signal. [10]

8. Explain about the noise performance of an FM receiver. [10]

OR

9. Explain the noise performance of SSB-SC receiver and prove its S/N ratio is unity. [10]

10. Draw the block diagram of Superhetrodyne receiver and explain the function of each block. [10]

OR

11.a) Explain, how a PPM signal can be generated from PWM signal?
b) Compare PAM, PWM and PPM pulse modulation techniques. [5+5]

---ooOoo---

17. References (Text books/websites/Journals):

https://ieeexplore.ieee.org/document/9339741

https://www.sciencedirect.com/science/article/pii/S0022435921000075

books.zip

WEBSITES

1. https://nptel.ac.in/courses/117/105/117105143/
2. https://nptel.ac.in/courses/117/101/117101051/
3. https://www.coursera.org/lecture/satellite-communications/introduction-f7Q1E
4. https://www.coursera.org/lecture/satellite-communications/from-analog-to-digital-AUNu1
5. www.mit.edu
6. http://web.stanford.edu/class/ee179/https://nptel.ac.in/courses/117/101/117101051/
7. https://www.udemy.com/course/analog-communication/

EXPERT DETAILS

The Expert Details which have been mentioned below are only a few of the eminent ones known Internationally, Nationally and Locally. There are a few others known as well.

INTERNATIONAL

Dr K. Sam Shanmugam is the AT&T Distinguished Professor of Electrical

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NATIONAL

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REGIONAL

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JOURNALS

1. 1IEEE Transactions on Communications (https://ieeexplore.ieee.org/xpl/recentissue.jsp?punumber=26)
2. International Journal of Communication Systems (https://onlinelibrary.wiley.com /toc / 10991131a/4/1)
3. Communication & Technology (https://www.springer.com/gp/engineering/signals-communication)
4. AEU - International Journal of Electronics and Communications (https://www.journals.elsevier.com / aeu-international-journal-of-electronics-and-communications)