

Techno India NJR Institute of Technology



Course File

Session 2021-22

Analog Communication (5EX4-05)

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For Techno India NJR Institute of Technology
पंकज पौरवाल
Dr. Pankaj Kumar Porwal
(Principal)



RAJASTHAN TECHNICAL UNIVERSITY, KOTA

Syllabus

III Year - V Semester: B.Tech. (Electrical And Electronics Engineering)

5EX4-05: ANALOG COMMUNICATION

Credit: 3
3L+0T+0P

Max. Marks: 150(IA:30, ETE:120)

End Term Exam: 3 Hours

SN	CONTENTS	HOURS
1	Introduction: Objective, scope and outcome of the course.	01
2	Noise Effects in Communication Systems: Resistor noise, Networks with reactive elements, Noise temperature, Noise bandwidth Effective input noise temperature, Noise figure. Noise figure & equivalent noise temperature in cascaded circuits.	08
3	Amplitude Modulation: Frequency translation, Recovery of base band signal, Spectrum & power relations in AM systems. Methods of generation & demodulation of AM-DSB, AM-DSB/SC and AM-SSB signals. Modulation & detector circuits for AM systems. AM transmitters & receivers.	08
4	Frequency Modulation: Phase & freq. modulation & their relationship, Spectrum & band width of a sinusoidally modulated FM signal, phasor diagram, Narrow band & wide band FM. Generation & demodulation of FM signals. FM transmitters & receivers. Comparison of AM, FM & PM. Pre emphasis & demphasis. Threshold in FM, PLL demodulator.	08
5	Noise in AM and FM: Calculation of signal-to-noise ratio in SSB-SC, DSBSC, DSB with carrier, Noise calculation of square law demodulator & envelope detector. Calculation of S/N ratio in FM demodulators, Super heterodyne receivers.	08
6	Pulse Analog Modulation: Practical aspects of sampling, Natural and flat top sampling. PAM, PWM, PPM modulation and demodulation methods, PAM-TDM.	08
	TOTAL	41

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Course Overview:

Student will learn fundamentals of Analog Communication from this 41-hour course. In this course, student will study the fundamental concepts and application of different devices and techniques used in analog communication. Also, they will study and learn different modulation techniques used in analog applications.

Course Outcomes:

CO.NO.	Cognitive Level	Course Outcome
1	Knowledge	Explain and compare different analog modulation schemes for their efficiency and bandwidth.
2	Analysis	Analyze the behavior of a communication system in presence of noise.
3	Synthesis	Design the pulsed modulation system and investigate their system performance.

Prerequisites:

1. Fundamentals of various signal types.
2. Must have completed the course on signal and systems.
3. Student should be able to solve the problems of various transforms.

Course Outcome Mapping with Program Outcome:

Course Outcome	Program Outcomes (PO's)											
	Domain Specific					Domain Independent						
CO. NO.	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	2	2	1	3	0	0	0	0	0	0	0
CO2	2	1	2	1	2	0	0	0	0	0	0	0
CO3	2	2	1	2	2	0	0	0	0	0	0	0

1: Slight (Low) , 2: Moderate (Medium), 3: Substantial (High)

Course Coverage Module Wise:

Lecture No.	Unit	Topic
1	1	Introduction: Objective, scope and outcome of the course.
2	2	Noise Effects in Communication Systems
3	2	Resistor noise
4	2	Networks with reactive elements
5	2	Noise temperature
6	2	Noise bandwidth

7	2	Effective input noise temperature
8	2	Noise figure
9	2	Noise figure & equivalent noise temperature in cascaded circuits
10	3	Amplitude Modulation:
11	3	Frequency translation, Recovery of base band signal
12	3	Spectrum & power relations in AM systems
13	3	Methods of generation & demodulation of AM-DSB
14	3	Methods of generation & demodulation of DSB-SC
15	3	Methods of generation & demodulation of SSB-SC
16	3	Modulation & detector circuits for AM systems
17	3	AM transmitters & receivers
18	4	Frequency Modulation:
19	4	Phase & freq. modulation & their relationship
20	4	Spectrum & band width of a sinusoidally modulated FM signal, phasor diagram
21	4	Narrow band & wide band FM
22	4	Generation & demodulation of FM signals
23	4	FM transmitters & receivers
24	4	Comparison of AM, FM & PM. Pre-emphasis & de-emphasis
25	4	Threshold in FM, PLL demodulator
26	5	Noise in AM and FM:
27	5	Calculation of signal-to-noise ratio in SSB-SC
28	5	Calculation of signal-to-noise ratio in DSB-SC
29	5	Calculation of signal-to-noise ratio in DSB with carrier
30	5	Noise calculation of square law demodulator
31	5	Noise calculation of envelope detector
32	5	Calculation of S/N ratio in FM demodulators
33	5	Super heterodyne receivers
34	6	Pulse Analog Modulation:
35	6	Practical aspects of sampling
36	6	Natural sampling
37	6	Flat top sampling
38	6	PAM modulation and demodulation methods
39	6	PWM modulation and demodulation methods
40	6	PPM modulation and demodulation methods
41	6	PAM-TDM

TEXT/REFERENCE BOOKS

1. Principles of Communication Systems, Herbert Taub, Donald Schilling, Goutam Saha, TMH
2. An Introduction To Analog & Digital Communications, Haykins, Wiley

3. Communication Systems Engineering, Proakis J. G. and Salehi M., Pearson Education

Teaching and Learning resources:

- **MOOC (NPTEL):** - <https://nptel.ac.in/courses/117/105/117105143/>

Assessment Methodology:

1. Practical exam using lab instruments.
2. Two Midterm exams where student have to showcase subjective learning.
3. Final Exam (subjective paper) at the end of the semester.

0362664
Roll No. SE1372
SE1372
B.Tech. V-Semester (Main) Examination, Nov. 2019
PCC/PEC Electrical and Electronics Engg
5EX4-05 Analog Communication
Time : 3 Hours
Maximum Marks : 120
Min. Passing Marks : 42

Instructions to Candidates:

Attempt all ten questions from Part A, five questions out of Seven from Part B and Four questions out of Five from Part C.

(Schematic diagrams must be shown wherever necessary. Any data you feel missing suitably be assumed and stated clearly). Units of quantities used/calculated must be stated clearly.

Part - A

(Answer should be given up to 25 words only)

All questions are compulsory

(10×2=20)

1. Calculate the noise voltage across a parallel combination of two resistor $R_1 = 5K\Omega$ and $R_2 = 10K\Omega$.
2. Draw the spectrum of AM when base band signal is 5KHz and carrier signal is 5MHz.
3. Write relation between S/N, ratio and noise figure.
4. Where Narrow band FM is more suitable?
5. Draw waveform of PPM signal.
6. If input signal is 5W KHz and intermediate frequency is 10KHz then find local oscillator frequency.
7. Write one difference between linear and square detector.
8. If total power in AM is 10 watt and Modulation index is 0.6 then find power in USB

9. Write the name of two sources for external noise.
10. Write the problem for obtain natural sampling.

Part - B

(Analytical/Problem solving questions)

Attempt any five questions

(5×8=40)

1. Explain and Draw Scheme of AM - SSB.
2. Compare the total Bandwidth in AM, FM and PM.
3. Draw Block diagram of super heterodyne receiver and define the image signal in it.
4. Develop relation between noise figure and noise temperature.
5. Draw the ckt diagram of diode detector for demodulate AM signal.
6. Draw the Block diagram of PLL and explain its uses.
7. How PWM signal is connected to PPM? Explain one scheme with required ckt.

Part - C

(Descriptive/Analytical/Problem Solving/Design Question)

Attempt any Four questions

(4×15=60)

1. Explain FM and find the expression of FM signal and Modulation index. How FM classified as Narrow and wide FM?
2. Draw Any ckt for obtain AM signal. If the base band signal is given by $i_b(t) = 0.01 \sin 10^3 t + 0.2 \sin 10^4 t$ and carrier signal is given as $i_c(t) = 10 \sin 10^6 t$
Find modulation index and power in CSB and USB.
3. Define flat sampling and Draw a ckt of it. Draw waveform of PAM signal; How and where such signals are used?
4. Draw and explain any one FM modulator ckt.
5. Draw and explain the working of envelope detector.