FR. Conceicao Rodrigues College Of Engineering

Father Agnel Ashram, Bandstand, Bandra-west, Mumbai-50

Department of Electronics Engineering

Subject: Principles of Communication Engineering (PCE-ELX405) **Credits-4**

S.E. (Electronics) (Semester 4)(2018-19)

1. SYLLABUS

Module No.	Unit No.	Topics	Hrs
1		**Introduction to Electronic Communication**	06
	1.1	**Introduction:** Electromagnetic frequency spectrum, concepts of wave propagation-ground wave, sky wave and space wave	
	1.2	**Elements of communication systems:** Information sources, communication channels, noise, sources of noises, need for modulation, bandwidth and power trade-off.	
	1.3	**1.3 Representation of the signals:** Fourier series, Fourier transform, two sided spectrum	
2		**Amplitude Modulation and demodulation**	10
	2.1	**Amplitude Modulation :** Types of Analog Modulation, Principles of Amplitude Modulation , AM for a Complex Modulating Signal, AM Power Distribution, AM Current Distribution, Limitations of AM , AM modulators and Demodulator	
	2.2	**Types of AM:** Modulation & Demodulation Techniques: DSB-SC, SSB-SC , Vestigial-Sideband (VSB) Modulation , Comparison of AM, DSBSC, SSB and VSB	
	2.3	**2.3** Applications of AM	
3		**Angle modulation and demodulation**	08
	3.1	Frequency Modulation: Principles of Angle Modulation, Theory of FM— Basic Concepts, Spectrum Analysis of FM Wave, Narrowband and Wideband FM, Noise triangle,Pre-emphasis, de-emphasis FM Generation: Direct methods and Indirect method,FM Detection: Frequency discriminator and Phase discriminator methods	
	3.2	**Phase Modulation** : Theory of Phase Modulation, Relationship between FM and PM, Advantages and Disadvantages of Angle Modulation, Comparison of AM, FM and PM	
	3.3	3 Applications of FM and PM	
4		**Radio Transmitters and Receivers**	08
	4.1	Radio receivers: Receiver Characteristics : Sensitivity, Selectivity, Fidelity, Image frequency rejection ratio, TRF Receivers and its characteristics , Concept of Heterodyning , Superheterodyne Receiver , choice of Intermediate frequency	
	4.2	**AM Transmitters and Receivers**: AM Radio Transmitters, AM Radio Receivers, Practical diode detector, Automatic Gain control(AGC), Types of AGC.	
	4.3	**FM Transmitters and Receivers**: FM Transmitters, FM Receivers , Automatic Frequency control(AFC) , Importance of Limiter,Communication Receivers	
5		**Pulse-Modulation and demodulation**	08
	5.1	**Introduction to digital transmission of signals**: comparison of Digital Analog Transmissions, Concept of regenerative Repeater	
	5.2	**Sampling and quantization**: Sampling Theorem, Aliasing error, Natural Sampling , Flat top sampling, Quantization of Signals	
	5.3	**Pulse Modulation Techniques** :Generation and detection of Pulse	

		Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM)	
6		**PCM and Multiplexing**	08
	6.1	**PCM**: Pulse-Code Modulation (PCM), Noise Performance of PCM Systems, Differential PCM (DPCM), Adaptive Differential PCM (ADPCM), Delta Modulation, Adaptive Delta Modulation, Continuous Variable Slope DM (CVSDM), Comparison of PCM Techniques	
	6.2	Multiplexing in Telecommunications Networks, Synchronous and Asynchronous TDM, Single-Channel PCM Transmission System, T1 Digital Carrier System, FDM	
		Total	48

2. Course Outcomes:

Upon completion of this course students will be able to:

ELX405.1 Explain various blocks of Electronic Communication Systems.

ELX405.2 Analyse various analog modulation methods.

ELX405.3 Implement analog modulation and demodulation.

ELX405.4 Describe different pulse modulation techniques.

ELX405.5 Explain multiplexing techniques like TDM and FDM.

3. Relationship of course outcomes with program outcomes: indicates 1-low importance,2-Moderate importace,3-High importance in each mapping cell

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**PSO 1**	**PSO 2**
ELX405.1	3													
ELX405.2	3	2		2										
ELX405.3			2		2				2	2	2		2	2
ELX405.4	3				2									
ELX405.5	3													
	3	2	2		2				2	2	2		2	2

4.CO assessment tools

Course Outcome	*Assessment Method*							
	Direct Method (80 %)							*Indirect Method (20%)*
	Unit Tests		Assignments		Laboratory Practical	Mini Project	End Sem Exam	Course exit survey
	1	2	1	2				
ELX405.1	30%	--	20%	--	--	--	50%	100%
ELX405.2	10%	10%	10%	--	10%	10%	50%	100%
ELX405.3	--	--	--	--	30%	20%	50%	100%
ELX405.4	--	20%	--	10%	10%	10%	50%	100%
ELX405.5	--	30%	--	10%	10%	--	50%	100%

5.Content beyond syllabus ---

6.Lesson plan

Periods (Hours) per week	***Lecture***	***4***	
	Practical		
	Tutorial		
Evaluation System		***Hours***	***Marks***
	Theory examination	3	80
	Internal Assessment	--	20
	Practical Examination	--	
	Oral Examination	--	
	Term work	--	
	Total	--	100

Time Table	***Day***	***Time***
	Monday	11.00-12.00pm
	Tuesday	11.00-12.00pm
	Thursday	11.00-12.00pm
	Friday	2.30pm-3.30pm

Course Content and Lesson plan

Module 1:Introduction to electroniccommunication

Week	Lecture No.	Date		Topic	Remarks(If any)
		Planned	Actual		
1	1	2/1/19	2/1/19	Introduction of basic communication system with block diagram, basic concept of modulation and demodulation etc	

	2	3/1/19	3/1/19	Electromagnetic frequency spectrum, concept of wave propagation	
	3	4/1/19	4/1/19	Need for modulation, sources of noise	
	4	7/1/19	7/1/19	Representation of signals in terms of Fourier series, fourier transform,two sided spectrum	
Module 2:Amplitude Modulation and Demodulation					
	5	9/1/19	9/1/19	Types of analog modulation,Principles of amplitude modulation	
	6	10/1/19	10/1/19	Equation and spectrum of AM waveform	
	7	11/1/19	11/1/19	Numericals on AM waveform,Current distribution in AM waveform	
	8	14/1/19	14/1/19	Power in AM and examples based on it	
	9	15/1/19	15/1/19	AM for complex modulating signal and its numericals	
	10	16/1/19	16/1/19	Advantages of DSBSC and SSBSC OVER DSBFC.Balanced modulator for AM generation	
	11	18/1/19	18/1/19	Filter method and phase shift method for SSBSC	
	12	21/1/19	21/1/19	Third method and VSB	
	13	22/1/19	22/1/19	Application of AM and comparison of different Types of AM. Problem solving from university papers.	
Module4 **: Radio Transmitters and receivers (AM)**					
	14	23/1/19	23/1/19	Need for receiver,Receiver characteristics	

	15	25/1/19	25/1/19	Receiver characteristics (Contd…), Numericals based on it	
	16	28/1/19	28/1/19	TRF receiver and its disadvantages, superheterodyne receiver	
	17	29/1/19	29/1/19	Diode detector, Practical diode detector with AGC	
	18	30/1/19	30/1/19	Choice of IF, Types of AGC	**Assignment1**
Module 4:Angle modulation and demodulation					
	19	1/2/19	1/2/19	Principles of Angle modulation,theory of FM,basic concepts	**UT1:4,5,6 FEB 2019**
	20	8/2/19	8/2/19	Spectrum analysis of FM and numerical based on it	
	21	11/2/19	11/2/19	FM generation methods	
	22	12/2/19	12/2/19	FM generation indirect method i.e. Armstrong method	**Euphoria:** **13,14,15 Feb 2019**
	23	18/2/19	18/2/19	Noise triangle,Narrowband and Wideband FM	
	24	20/2/19	20/2/19	Pre-Emphasis and De-Emphasis	
	25	22/2/19	22/2/19	Theory of Phase modulation,Relationship between AM and FM,Advantages and disadvantages	
	26	25/2/19	25/2/19	Principle of slope detection, FM Receiver	
	27	26/2/19	26/2/19	Frequency discriminators	
	28	27/2/19	27/2/19	Frequency discriminators (Contd…)	
	29	28/2/19	28/2/19	Importance of limiter and AFC	**Assignment 2**

Module 5 : Pulse modulation and Demodulation					
	30	1/3/19	1/3/19	Comparison between analog and digital signal transmission, Concept of repeater	
	31	5/3/19	5/3/19	Sampling theorem and its proof,Aliasing Error	
	32	6/3/19	6/3/19	Types of Sampling	
	33	8/3/19	8/3/19	Quantization of signals, Generation of PAM	
	34	11/3/19	11/3/19	Generation of PWM and PPM	
Module 6 :PCM and Multiplexing					
	35	12/3/19	12/3/19	PCM,Noise performance of PCM system	
	36	13/3/19	13/3/19	DPCM,ADPCM	
	37	18/3/19	18/3/19	DM and ADM	
	38	19/3/19	19/3/19	Continuous Variable slope detection, Comparision of PCM techniques	**Assignment 3**
	39	20/3/19	20/3/19	Multiplexing in telecommunication network,synchronous and asynchronous TDM	
	40	22/3/19	22/3/19	T1 digital carrier system	
	41	25/3/19	25/3/19	FDM	
	42	26/3/19	26/3/19	Revision	
	43	27/3/19	27/3/19	Revision	
	44	29/3/19		University paper solving	

	45.	3/4/19		Numericals solving	

Text- Books:

1.Wayne Tomasi "*Electronics communication systems*" Pearson education, Third edition, 2001.
2. Kennedy and Davis "*Electronics communication system* ",Tata McGraw Hill
3. R.P. Sing and S.D. Sapre, "*Communication systems Analog and Digital*", Tata McGraw Hill
4. Taub and Schilling "*Principles of communication systems*", Tata McGraw Hill
5. Roy Blake, "*Electronics communication system*", Thomson learning, second edition.
6. B.P. Lathi "*Modern Digital and analog Communication system*" Third edition, OXFORD
7. Robert J. Schoenbeck "*Electronics communications modulation and transmission*".
8. Lean W couch "*Digital and Analog communication system*", Pearson education, Sixth edition.
9. Roddy Coolen, "*Electronic Communications*" PHI

Internal Assessment:

Two tests will be conducted which will cover at least 80% of syllabus.

The average marks of both the tests will be considered as final IA marks

Semester End Theory Examination:

1. Question paper will comprise of total 6 questions, each of 20 marks.
2. Only 4 questions need to be solved.
3. Question number 1 will be compulsory and will cover all modules whereas sub questions of 2 to 5 marks will be asked
4. Remaining questions will be asked from all the modules

7.Practical plan

Academic Term	Jan – April 2019
Subject	**Principles of Communication Engineering Laboratory**

Evaluation System		***Hours***	***Marks***
	Practical Examination	--	
	Oral Examination	--	
	Term work	--	25
	Total	--	25

Time Table	***Day***	***Batch***	***Time***
	Monday	***D***	***1.30 to 3.30 p.m***
	Tuesday	***A***	***1.30 to 3.30 p.m***
	Wednesday	***B***	***2.30 to 4.30 p.m***
	Thursday	***C***	***2.30 to 4.30 p.m***

Title of Experiments

Sr. No.	***Title***	***Module***	***Attained POs***
1	To study Amplitude modulation and demodulation	Amplitude Modulation and Demodulation	PO1, PO5
2	To study Frequency modulation and demodulation	Angle modulation and demodulation	PO1, PO5
3	To study Super heterodyne receiver	Radio Transmitters and Receivers	PO1, PO5
4	To study Sampling and reconstruction	Pulse-Modulation and Demodulation	PO1, PO5
5	To study Delta Modulation	PCM and Multiplexing	PO1, PO5
6	To study time division multiplexing	PCM and Multiplexing	PO1, PO5

7	To generate PAM and PWM waveforms	Pulse modulation and demodulation	PO1, PO5
8	Miniproject	Covering any module from the syllabus	PO1, PO5

Overall (all experiments together) mapping with POs

	Programme Outcomes
HI	PO1, PO5
MI	
LI	

Newly added experiments

1	To generate PAM and PWM waveforms in MATLAB
2.	To study pulse code modulation

Practical Session Plan

Batch	***Dates***		***Remarks***
	Planned	***Actual***	
Experiment No. 1 To study Amplitude modulation and demodulation			
A	14-1-19	14-1-19	
B	15-1-19	15-1-19	
C	16-01-19	16-01-19	
D	17-01-19	17-01-19	
Experiment No. 2 To study frequency modulation and demodulation			
A	21-1-19	21-1-19	

B	22-1-19	22-1-19	
C	23-01-19	23-01-19	
D	24-01-19	24-01-19	
Experiment No. 3 To study Super heterodyne receiver			
A	28-1-19	28-1-19	
B	29-1-19	29-1-19	
C	30-02-19	30-02-19	
D	7-02-19	7-02-19	
Experiment No. 4 To study Sampling and reconstruction			
A	11-02-19	11-02-19	
B	12-2-19	12-2-19	
C	20-02-19	20-02-19	
D	21-02-19	21-02-19	
Experiment No.5 To study Delta Modulation			
A	18-2-19	18-2-19	
B	26-2-19	26-2-19	
C	27-03-19	27-03-19	
D	28-02-19	28-02-19	
Experiment No. 6 To study Pulse code modulation			
A	18-2-19	18-2-19	

B	26-2-19	26-2-19	
C	27-03-19	27-03-19	
D	28-02-19	28-02-19	
Experiment No. 6 To study Time division multiplexing			
A	18-2-19	18-2-19	
B	26-2-19	26-2-19	
C	27-03-19	27-03-19	
D	28-02-19	28-02-19	
Experiment No. 7 To generate PAM and PWM waveforms in MATLAB			
A	25-2-19	25-2-19	
B	5-3-19	5-3-19	
C	6-03-19	6-03-19	
D	7-03-19	7-03-19	
Experiment No. 8 Miniproject			
A	11-3-19,18-3-19,25-3-19	11-3-19,18-3-19,25-3-19	
B	12-3-19,19-3-19,26-3-19	12-3-19,19-3-19,26-3-19	
C	13-3-19,20-3-19,27-3-19	13-3-19,20-3-19,27-3-19	
D	14-03-19, 28-03-18	14-03-19, 28-03-18	

Term Work:

At least 6 experiments covering entire syllabus of ELX 405 (Principles of Communication Engineering) should be set to have well predefined inference and conclusion. The experiments should be student centric and attempt should be made to make experiments more meaningful, interesting. Simulation experiments are also encouraged. Experiment must be graded from time to time. Also each student (in group of 3/4) has to perform a Mini Project as a part of the laboratory and report of mini project should present in laboratory journal. The grades should be converted into marks as per the Credit and Grading System manual and should be added and averaged. The grading and term work assessment should be done based on this scheme. The final certification and acceptance of term work ensures satisfactory performance of laboratory work and minimum passing marks in term work.