INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)

(Approved by AICTE | NAAC Accreditation with "A" Grade | Accredited by NBA | Affiliated to JNTUH)

Dundigal, Hyderabad - 500 043, Telangana

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTION

Course Title	**Analog Communications**			
Course Code	A50408			
Academic Year	2017 – 2018			
Course Structure	**Lectures**	**Tutorials**	**Practicals**	**Credits**
	5	-	-	4
Course Coordinator	Dr. Prof. P G Krishan Mohan			
Team Instructors	Dr. V Siva Raju, Dr.P.Muna swamy, T Nagarjuna,			
Branch	III- B. Tech I Semester, ECE			

1. COURSE OVERVIEW

Almost every day we are aware, or make use, of concepts such as electronic mail, wired cities, overnight stock market quotes fed into our home computers, tele conferencing, and a host of space and military applications of electronic communication. This subject is concerned with the theory of systems for the conveyance of information. The transmission of information-bearing signal over a band pass communication channel, such as telephone line or a satellite channel usually requires a shift of the range of frequencies contained in the signal to another frequency range suitable for transmission. A shift in the signal frequency range is accomplished by modulation. This chapter introduces the definition of modulation, need of modulation, types of modulation- AM, PM and FM, Various types of AM, spectra of AM, bandwidth requirements, Generation of AM & DSB-SC, detection of AM & DSB-SC, and power relations

2. PREREQUISITE(S):

Level	Credits	Periods/ Week	Prerequisites
UG	4	5	Knowledge of Signals and Systems,electronic circuits

3. MMARKS DISTRIBUTION:

Sessional Marks	University End Exam marks	Total marks
Midterm Test There shall be two midterm examinations. Each midterm examination consists of essay paper, objective paper and assignment.	75	100

Sessional Marks	University End Exam marks	Total marks
The essay paper is for 10 marks of 60 minutes duration and shall contain 4 questions. The student has to answer 2 questions, each carrying 5 marks. The objective paper is for 10 marks of 20 minutes duration. It consists of 10 multiple choice and 10 fill-in-the blank questions, the student has to answer all the questions and each carries half mark. First midterm examination shall be conducted for the first two and half units of syllabus and second midterm examination shall be conducted for the remaining portion. Five marks are earmarked for assignments. There shall be two assignments in every theory course. Assignments are usually issued at the time of commencement of the semester. These are of problem solving in nature with critical thinking. Marks shall be awarded considering the average of two midterm tests in each course.		

4. EVALUATION SCHEME:

S. No	Component	Duration	Marks
1.	I Mid Examination	80 minutes	20
2.	I Assignment	-	5
3.	II Mid Examination	80 minutes	20
4.	II Assignment	-	5
5.	External Examination	3 hours	75

5. Course Objectives:

I. Develop skills for analyzing different types of signals in terms of their properties such as energy, power, correlation and apply for analysis of linear time invariant systems.

II. Analyze various techniques of generation and detection of amplitude modulation (AM), frequency modulation (FM) and phase modulation (PM) signals.

III. Differentiate the performance of AM, FM and PM systems in terms of Power, Bandwidth and SNR (Signal-to-Noise Ratio).

IV. Evaluate Analog Communication system in terms of the complexity of the transmitters and receivers.

1. Course Outcomes:

1. Understand the baseband signal and system.
2. Identify various element processes and parameters in telecommunication systems and describe their functions, effects and inter relationship.
3. Design procedure of AM transmission and reception, Analyze, Measure and Evaluate the performance of a Telecommunication system against given criteria.
4. Understand basic knowledge of FM transmission and reception

5. Understand various types of DSB &SSB transmission and reception.
6. Understand various types of VSB transmission and reception.
7. Design Tuned Radio frequency receiver and Super Heterodyne receiver
8. Understand the concepts of generation of PAM,PPM,PWM
9. Learn different multiplexing techniques.
10. Design Typical Telecommunication system that consists of basic and essential building blocks.
11. Knowledge of developing the electronic circuits using emerging trends in technology
12. Identify various noise sources and their parameters and their effect on analog and angle modulation techniques.
13. Analyze noise performance for AM,FM,DSBSC,SSBSC
14. Design of pre-emphasis,De-emphasis
15. Understand Receiver characteristics

2. How Course Outcomes are assessed:

Program Outcomes		Level	Proficiency assessed by
PO1	**Fundamental Engineering Analysis Skills** An ability to apply knowledge of mathematics, science and engineering fundamentals to the conceptualization of engineering models	S	Assignments, Exercises
PO2	**Information retrieval skills** An ability to design and conduct experiments, as well as analyze and interpret the data.	H	Hands on Practice Sessions
PO3	**Creative Skills** An ability to design, implement and evaluate an electronics & communication engineering based system, component are process to meets desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.	S	Lab Sessions
PO4	**Team Work** An ability to function effectively as an individual and as a member or a leader in multidisciplinary teams	N	--
PO5	**Engineering Problem Solving Skills** An ability to identify, formulate and apply appropriate techniques, resources and to solve complex electronics & communication engineering problems	S	Design Exercises

PO6	**Professional Integrity**. An understanding of professional ethics and responsibilities of engineering practice	N	--
PO7	**Communication Skills** An ability to communicate effectively on complex electronics and communication engineering activities with the engineering community and society at large such as writing effective reports and making effective presentations.	N	--
PO8	**Engineering impact assessment skills**. Understanding of the impact of engineering solutions in a global, economic, environmental and societal context	N	--
PO9	**Continuing education awareness** An ability to engage in life-long learning and an understanding of the need to keep current of the developments in the specific field of practice.	S	Seminars Discussions
PO10	**Social awareness** Knowledge of contemporary issues like increased use of portable devices, rising health care costs and etc. which influence engineering design	N	--
PO11	**Practical engineering analysis skills** An ability to use current techniques, skills and modern engineering tools necessary to analyze electronics &communication engineering practice.	H	Design Exercises, Seminars, Paper Presentations
PO12	**Software and Hardware Interface** An ability to apply creativity in design and development of electronic circuits, equipment components, sub-systems and systems	S	Design Exercises, Development of Prototypes, Mini Projects
PO13	**Successful Career and Immediate Employment**. An ability to recognize the importance of professional developments by pursuing post graduate studies or facing competitive examinations that offer challenging and rewarding careers in designing	H	Exams, Discussions

N = None **S = Supportive** **H = Highly Related**

3. **HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:**

Program Specific Outcomes		**Level**	**Proficiency assessed by**
PSO1	**Professional Skills:** The ability to research, understand and implement computer programs in the areas related to algorithms, system software, multimedia, web design, big data analytics, and networking for efficient analysis and design of computer-based systems of varying complexity.	H	Lectures, Assignments
PSO2	**Problem-solving Skills:** The ability to apply standard practices and strategies in software project development using open-ended programming environments to deliver a quality product for business success.	H	Projects
PSO3	**Successful Career and Entrepreneurship:** The ability to employ modern computer languages, environments, and platforms in creating innovative career paths, to be an entrepreneur, and a zest for higher studies.	S	Guest Lectures

N – None **S – Supportive** **H – Highly Relate**

4. SYLLABUS:

UNIT-1.AMPLITUDE MODULATION

Introduction to communication system, Need for modulation, Frequency division multiplexing, Amplitude modulation, Definition, Time domain and Frequency domain description, Single tone modulation, Power relations in AM wave, Generation of AM Waves, Square law modulator, Switching modulator, Detection of AM waves, Square law detector, Envelope detector. DSB-SC modulation, time domain and frequency domain description, Generation of DSB-SC waves, Balanced Modulator, Ring Modulator, Coherent detection of DSB-SC Modulated waves, COSTAS Loop

UNIT-II. SSB MODULATION

Frequency domain description, Frequency discrimination method for generation of AM- SSB Modulated wave, Time domain description, Phase discrimination method for generating of AM SSB Modulated waves, Demodulation of SSB Waves, Vestigial side band modulation, Generation of VSB modulated wave, Time domain description, Envelop detection of VSB wave pulse carrier, Comparison of AM techniques, Applications of different AM waves.

UNIT-III. ANGLE MODULATION

Basic concepts, Frequency Modulation, Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission band width of FM wave, Generation of FM Waves, Direct FM, Detection of FM waves, Balanced frequency discriminator, Zero crossing detector, Phase locked loop, Comparison of AM & FM

UNIT-IV.NOISE IN ANALOG COMMUNICATION SYSTEMS

Types of Noise: Resistive (Thermal) Noise source, shot noise, Extraterrestrial Noise, Arbitrary noise sources, white noise, Narrowband Noise-In phase and quadrature phase components and its properties,Modeling of Noise sources, Average noise Bandwidth,Effective Noise Temperature,Average Noise figures,Average noise Figure of cascaded networks.
NOISE: Noise in DSB and SSB system, Nose in A M system, Nose in angle modulated **system**, Noise Triangle in Angle modulation system, Pre-emphasis and De-emphasis.

UNIT-V. RECEIVERS

Radio Receiver-Receiver types, Tuned Radio Frequency receivers, Super heterodyne receiver, RF section and characteristics, Frequency changing and Tracking, Intermediate frequency, AGC, FM receiver, Comparison with AM receiver, amplitude limiting.

PULSE MODULATION

Types of pulse modulation PAM(single polarity, double polarity, PWM, Generation and Demodulation of PWM,PPM, Generation and Demodulation of PPM, Time Division Multiplexing

TEXT BOOKS:

1. Communication Systems – B.P. Lathi, BS Publication, 2004.
2. Principles of Communication Systems – Simon Haykin, John Wiley, 2nd Ed.

REFERENCES:

1. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004
2. Electronic Communication 4th Edition – Dennis Roddy and John Coolean PEA, 2004.
3. Analog and Digital Communication – K. Sam Shanmugam, willey 2005. 4.Electronic Communication Systems – Modulation and Transmission, Robert J. Schoenbeck 2nd ecition,PHI 5.Principles of Communication systems, H.Taub and De Shillong, TMH 2007,3rd Edition

X Course Plan:

At the end of the course, the students are able to achieve the following course learning outcomes:

Lecture No.	Topics to be covered	Course Learning Outcomes	Reference
1-2	Introduction to communication system, Need for modulation, Frequency division multiplexing, Amplitude modulation, Definition	**Discuss** the need of modulation ,categorization of modulation techniques	**T2-3.1,3.9**
3-6	Time domain and Frequency domain description, Single tone modulation, Power relations in AM wave	**Illustrate** time domain and frequency domain representation of AM	**T2-3.2**
7-9	Generation of AM Waves, Square law modulator, Switching modulator, Detection of AM waves, Square law detector, Envelope detector	**Generation** and demodulation of AM Waves	**T2-3.2**
10-11	DSB-SC modulation, time domain and frequency domain description, Generation of DSB-SC waves	**Discuss** time domain and frequency domain analysis.	**T2-3.4**
12-14	Balanced Modulator, Ring Modulator Coherent detection of DSB-SC Modulated waves, COSTAS Loop	**Demonstrate** DSB-SC modulation and demodulation techniques	**T2-3.4**
15-17	Frequency domain description, Frequency discrimination method for generation of AM- SSB Modulated wave	**Understand** various generation and detection techniques	**T2-3.7**
18-21	Time domain description, Phase discrimination method for generating of AM SSB Modulated waves Demodulation of SSB Waves	**Description** of SSB Wave in time domain and frequency domain	**T2-3.7**
22-23	Vestigial side band modulation, Generation of VSB modulated wave, Time domain description	**Demonstrate** about VSB modulation and demodulation technique	**T2-3.6**

24-25	Envelop detection of VSB wave pulse carrier, Comparison of AM techniques Applications of different AM waves	**Comparison** of different modulation techniques	**T2-3.6**
26-28	Basic concepts, Frequency Modulation Single tone frequency modulation Spectrum Analysis of Sinusoidal FM Wave	**Understand** the concepts of FM wave ,calculation of power and bandwidth	**T2-3.10**
29-31	Narrow band FM, Wide band FM Constant Average Power, Transmission band width of FM wave	**Comparison** of NBFM and WBFM.	**T2-3.11**
32-35	Generation of FM Waves, Direct FM Detection of FM waves, Balanced frequency discriminator	**Generation** and detection techniques of FM Wave	**T2-3.11**
36-39	Zero crossing detector, Phase locked loop, Comparison of AM & FM	**Comparison** of AM & FM and **Demonstrate** PLL	**T2-3.11**
40-42	Types of Noise: Resistive (Thermal) Noise source, shot noise, Extraterrestria Noise, Arbitrary noise sources, white noise.	**Analysis** of different noise sources and their related parameters	**T1-6.1 to 6.3**
43-44	Narrowband Noise-In phase and quadrature phase components and its properties, Modeling of Noise sources	**Analysis** of different Noise parameters	**T1-6.5 to 6.7**
45-46	Average noise Bandwidth, Effective Noise Temperature, Average Noise figures, Average noise Figure of cascaded networks.	**Analysis** of different Noise parameters	**T16.8 to 6.11**
47-49	NOISE: Noise in DSB and SSB system, Nose in AM system,	**Effect** of Noise on Different modulation techniques and	**T2-5.3 to 5.5**
50-53	Nose in angle modulated system, Noise Triangle in Angle modulation system, Pre-emphasis and De-emphasis.	**Explanation** of Pre-Emphasis and De-Emphasis circuit	**T2-5.6 to 5.7**
54-56	Radio Receiver-Receiver types, Tuned Radio Frequency receivers, Super heterodyne receiver	**Classification** of different receivers and their working principles with block diagrams.	**R1**
57-60	RF section and characteristics Frequency changing and Tracking Intermediate frequency, AGC, FM receiver Comparison with AM receiver amplitude limiting.	**Explain** different receiver parameters	**R1**
61-63	PULSE MODULATION: Types of pulse modulation PAM(single polarity, double polarity	**Discuss** about various pulse modulation and demodulation techniques	**T2-6.2 to 6.3**
64-65	Generation and Demodulation of PWM,PPM	modulation and demodulation techniques	**T2-6.4 to 6.5**

66-67	Time Division Multiplexing	**Explain** about TDMA	**T2-6.4 to 6.5**
68-72	Revision		

13. MAPPING COURSE OBJECTIVES LEADING TO THE ACHIEVEMENTOF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Objectives	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1	H	S	H	S		S	H		S			S	S	S	
2		S	H	S							S	S		S	S
3	H		H	S		S			S	S	S	S	S	S	S
4	H			S		S				S		S	S		S
5	H	S	H	S		S	H		S			S	S	S	
6		S	H	S							S	S		S	S

S – Supportive **H - Highly Related**

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14. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENTOF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Outcomes	Program Outcomes												Program Specific Outcomes		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
1		S				S	H		S	S	S		S	S	S
2	H	S	H	S		S	H		S			S		S	S
3		S	H	S							S	S	S		S
4	H		H	S		S			S	S	S	S		S	S
5	H			S		S				S		S	S		S
6		S				S	H		S	S	S		S	S	S
7	H	S					H			S	S	S		S	S
8		S	H	S		S	H					S	S		S
9	H	S	H	S		S			S		S			S	

10			H	S		S			S	S	S	S	S	S	S
11	H			S					S	S				S	S
12		S				S	H			S	S		S		S
13	H	S				S	H		S	S		S		S	
14		S	H	S		S	H		S		S	S	S	S	S

S – Supportive **H - Highly Related**

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