INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	**DIGITAL COMMUNICATIONS LABORATORY**				
Course Code	AEC105				
Programme	B.Tech				
Semester	V	ECE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	2
Chief Coordinator	Dr. S.Vinoth, Associate Professor				
Course Faculty	Mr. G.Kiran Kumar, Assistant Professor Ms. M.Saritha, Assistant Professor Ms. A.Usha Rani, Assistant Professor				

I. COURSE OVERVIEW:

This laboratory course builds on the "digital communications" which is mandatory for all students of electronics and communication engineering. The course aims at practical experience with the processing the digital signals for various modulations and demodulations. Experiments cover fundamental concepts of the digital modulation and demodulation process. The objective of this laboratory is to enable the students to acknowledge with various digital modulation techniques. They can critically analyze the behavior of their implementation

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEC104	IV	Analog Communications	2

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Digital Communications Laboratory	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

✘	Chalk & Talk	✘	Quiz	✘	Assignments	✘	MOOCs
✔	LCD / PPT	✘	Seminars	✘	Mini Project	✘	Videos
✘	Open Ended Experiments						

V. EVALUATION METHODOLOGY:

Each laboratory will be evaluated for a total of 100 marks consisting of 30 marks for internal assessment and 70 marks for semester end lab examination. Out of 30 marks of internal assessment, continuous lab assessment will be done for 20 marks for the day to day performance and 10 marks for the final internal lab assessment.

Semester End Examination (SEE): The semester end lab examination for 70 marks shall be conducted by two examiners, one of them being Internal Examiner and the other being External Examiner, both nominated by the Principal from the panel of experts recommended by Chairman, BOS.

The emphasis on the experiments is broadly based on the following criteria:

20 %	To test the preparedness for the experiment.
20 %	To test the performance in the laboratory.
20 %	To test the calculations and graphs related to the concern experiment.
20 %	To test the results and the error analysis of the experiment.
20 %	To test the subject knowledge through viva – voce.

Continuous Internal Assessment (CIA):

CIA is conducted for a total of 30 marks (Table 1), with 20 marks for continuous lab assessment during day to day performance, 10 marks for final internal lab assessment.

Table 1: Assessment pattern for CIA

Component	**Laboratory**		**Total Marks**
Type of Assessment	Day to day performance	Final internal lab assessment	
CIA Marks	20	10	30

Continuous Internal Examination (CIE):

One CIE exams shall be conducted at the end of the 16th week of the semester. The CIE exam is conducted for 10 marks of 3 hours duration.

Preparation	**Performance**	**Calculations and Graph**	**Results and Error Analysis**	**Viva**	**Total**
2	2	2	2	2	10

VI. HOW PROGRAM OUTCOMES ARE ASSESSED:

Program Outcomes (POs)		Strength	Proficiency assessed by
PO 1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	3	Lab related Exercises
PO 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.	2	Lab related Exercises
PO 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.	2	Lab related Exercises

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes (PSOs)		Strength	Proficiency assessed by
PSO 1	**Professional Skills:** An ability to understand the basic concepts in Electronics & Communication Engineering and to apply them to various areas, like Electronics, Communications, Signal processing, VLSI, Embedded systems etc., in the design and implementation of complex systems.	2	Lab related Exercises
PSO 2	**Problem-Solving Skills:** An ability to solve complex Electronics and communication Engineering problems, using latest hardware and software tools, along with analytical skills to arrive cost effective and appropriate solutions.	-	-
PSO 3	**Successful Career and Entrepreneurship:** An understanding of social-awareness & environmental-wisdom along with ethical responsibility to have a successful career and to sustain passion and zeal for real-world applications using optimal resources as an Entrepreneur.	-	-

3= High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Analyze various digital modulation techniques.
II	Verify the sampling theorem.
III	Understand the spectral characteristics of PAM and QAM.
IV	Analyze various pulse modulation techniques.

IX. COURSE LEARNING OUTCOMES (CLOs):

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEC105.01	CLO 1	Understand Sampling theorem.	PO 1	3
AEC105.02	CLO 2	Understand Analyse Pulse Amplitude modulation.	PO 1	3
AEC105.03	CLO 3	Understand Pulse width modulation.	PO 1	3
AEC105.04	CLO 4	Understand Pulse position modulation.	PO 1	2
AEC105.05	CLO 5	Analyze the generation and detection of PCM.	PO 5	3
AEC105.06	CLO 6	Analyze the generation and detection of Differential Pulse Code modulation.	PO 1	3
AEC105.07	CLO 7	Analyze the generation and detection of Delta modulation.	PO 2	3
AEC105.08	CLO 8	Analyze the generation and detection of Frequency Shift Keying.	PO 5	3
AEC105.09	CLO 9	Analyze the generation and detection of Phase Shift Keying.	PO 5	2
AEC105.10	CLO 10	Analyze the generation and detection of DPSK.	PO 2	3
AEC105.11	CLO 11	Analyze the generation and detection Amplitude Shift Keying.	PO 5	3
AEC105.12	CLO 12	Study Of The Spectral Characteristics of PAM and QAM.	PO 1	2
AEC105.13	CLO 12	Analyze the generation and detection of Quadrature Phase Shift Keying.	PO 5	2
AEC105.14	CLO 12	Determine the bandwidth and phase of the signals using MATLAB for QPSK & DPSK.	PO 5	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES:

Course Learning Outcomes (CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 1	3				2								1		
CLO 2	2	3											1		
CLO 3	3				3								1		
CLO 4	2				2								2		
CLO 5					2								3		
CLO 6	2	2											1		
CLO 7		2			2								2		
CLO 8					2								1		
CLO 9		3			2								2		
CLO 10		2											1		
CLO 11					1								2		
CLO 12	3												2		
CLO 13					2								2		
CLO 14					2								1		

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1, PO2, PO5, PSO1	SEE Exams	PO1, PO2, PO5, PSO1	Assignments	-	Seminars	-
Laboratory Practices	PO1, PO2, PO5, PSO1	Student Viva	PO1, PO2, PO5, PSO1	Mini Project	-	Certification	-
Term Paper	-						

XII. ASSESSMENT METHODOLOGIES – INDIRECT

✔	Early Semester Feedback	✔	End Semester OBE Feedback
✘	Assessment of Mini Projects by Experts		

XIII. SYLLABUS:

LIST OF EXPERIMENTS	
Week-1	**SAMPLING THEOREM VERIFICATION**
Verification of sampling theorem for under, perfect, over sampling cases.	
Week-2	**PULSE AMPLITUDE MODULATION AND DEMODULATION**
Generation of Pulse Amplitude modulation and demodulation using hardware and matlab.	
Week-3	**PULSE WIDTH MODULATION AND DEMODULATION**
Generation of Pulse width modulation and demodulation using hardware and matlab.	
Week-4	**PULSE POSITION MODULATION AND DEMODULATION**
Generation of pulse position modulation and demodulation using hardware and matlab.	
Week-5	**PULSE CODE MODULATION**
Generation of pulse code modulation and demodulation using hardware and understanding the concept analog to digital conversion.	
Week-6	**DIFFERENTIAL PULSE CODE MODULATION**
Generation of differential pulse code modulation and demodulation using hardware.	
Week-7	**DELTA MODULATION**
Generation of delta modulation and demodulation using hardware .Understanding difference between PCM and DM.	
Week-8	**FREQUENCY SHIFT KEYING**
Generation of Frequency shift keying modulation and demodulation using hardware.	
Week-9	**PHASE SHIFT KEYING AND DIFFERENTIAL PHASE SHIFT KEYING**
Generation of Phase shift keying and DPSK modulation and demodulation using hardware.	
WeeK-10	**AMPLITUDE SHIFT KEY(ASK) AND QUADRATURE PHASE SHIFT KEYING**
Generation of Amplitude Shift Key and QPSK	
Week-11	**STUDY OF THE SPECTRAL CHARACTERISTICS OF PAM AND QAM**
Understand frequency domain description of PAM and QAM.	
Week 12	**MATLAB for QPSK & DPSK**
Understand frequency domain description of amplitude modulation and frequency modulation.	

XIV. COURSE PLAN:

The course plan is meant as a guideline. Probably there may be changes.

Week No.	Topics to be covered	Course Learning Outcomes	Reference
1	Understand Sampling theorem.	CLO 1	R1-5.2 to 5.3
2	Understand Analyse Pulse Amplitude modulation.	CLO 2	R1-5.4 to 5.5
3	Understand Pulse width modulation.	CLO 3	R1-5.6 to 5.7
4	Understand Pulse position modulation.	CLO 4	R1-6.3 to 6.4
5	Analyze the generation and detection of PCM.	CLO 5	R2-11.4 to 1.5
6	Analyze the generation and detection of Differential Pulse Code modulation.	CLO 6	R2-9.10 to 9.14
7	Analyze the generation and detection of Delta modulation.	CLO 7	R1-5.5 to 5.6
8	Analyze the generation and detection of Frequency Shift Keying.	CLO 8	R1-5.6 to 5.7
9	Generation of Phase shift keying and DPSK modulation and demodulation using hardware..	CLO 9	R3-4.4 to 4.5
10	Generation of Amplitude Shift Key and QPSK	CLO 10	R1-4.6 to 4.7
11	Understand frequency domain description of PAM and QAM	CLO 11	R1- 4.11 to 4.12
12	Understand frequency domain description of amplitude modulation and frequency modulation.	CLO 12	R1-5.3 to 5.4

XV. GAPS IN THE SYLLABUS - TO MEET INDUSTRY / PROFESSION REQUIREMENTS:

S.No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	To improve standards and analyze the concepts.	Seminars	PO 1, PO 2	PSO 1
2	Conditional probability, Sampling distribution, correlation, regression analysis and testing of hypothesis	Seminars / NPTEL	PO 2, PO5	PSO 1
3	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 5	PSO 1

Prepared by:

Dr. S. Vinoth, Associate Professor

HOD, ECE