INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	SIMULATION LABORATORY				
Course Code	AHS107				
Programme	B.Tech				
Semester	III	ECE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	2
Chief Coordinator	Mrs. Bindusree, Assistant Professor				
Course Faculty	Mr .Kaul , Professor Mrs. Ajitha G, Assistant Professor Mr Anil Reddy G, Assistant Professor Mr. N Nagaraju, Assistant Professor				

I. COURSE OVERVIEW:

The course aims at practical experience with the generation and simulation of basic signals, using standardized environments such as MATLAB. Experiments cover fundamental concepts of basic operation on matrices, generation of various signals and sequences, operation on signals and sequences, convolution, autocorrelation and cross correlation between signals and sequences. The objective of this laboratory is to enable the students to acknowledge with basic signals, and system responses. They can critically analyze the behavior of their implementation, and observe the specific limitations inherent to the computational platform like MATLAB.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
-	-	-	-	-

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Simulation 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 exam 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.	2	Coding and design observations
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	Simulation graphs
PO 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.	2	Term observations
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.	3	-

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:** The 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:** The 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.	2	Lab related Exercises
PSO 3	**Successful Career and Entrepreneurship:** The 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.	2	Presentation on real-world problems

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Analyze the generation Various Signals and Sequences in MATLAB, including the operations on Signals and Sequences.
II	Compute convolution and correlation of various signals
III	Analyze the Fourier Transform of a given signal and plotting its magnitude and phase spectrum.

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
AHS107.01	CLO 1	Understand Basics of MATLAB syntax, functions and programming.	PO 1, PO 5	3
AHS107.02	CLO 2	Analyze the generation Various Signals and Sequences in MATLAB.	PO 1, PO 2	2
AHS107.03	CLO 3	Perform various operations on the signals including Time shifting, Scaling, Reversal, Amplitude Scaling.	PO 2	2
AHS107.04	CLO 4	Compute the Fourier Transform of a given signal and plotting its magnitude and phase spectrum	PO 2, PO 4	3
AHS107.05	CLO 5	Determine the Convolution between Signals and sequences.	PO 2, PO 4	3
AHS107.06	CLO 6	Determine the Correlation between Signals and sequences.	PO 2, PO 4	3
AHS107.07	CLO 7	Verification of Weiner-Khinchine Relations i.e Auto Correlation and Power Spectral Density forms Fourier transform pair.	PO 4	2
AHS107.08	CLO 8	Verification of time shifting and time reversal properties of Fourier Transform.	PO 4	2
AHS107.09	CLO 9	Remember for Locating the Zeros and Poles and plotting the Pole-Zero maps Z-Plane for the given transfer function.	PO 4, PO 5	2
AHS107.10	CLO 10	Draw Distribution and density functions of standard random variables.	PO 4	2
AHS107.11	CLO 11	Verify Gibbs Phenomenon and understand the concept of fourier series of a signal.	PO 2	2
AHS107.12	CLO 12	Generation of Gaussian noise (Real and Complex), Computation of its mean, M.S. Value and its Skew	PO 4, PO 5	2
AHS107.13	CLO 13	Analyze and synthesize different signals for a wide application range.	PO 4	2

3 = High; 2 = Medium; 1 = Low

X. MAPPING COURSE LEARNING OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES AND PROGRAM SPECIFIC 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				3										
CLO 2	2	2											3	1	
CLO 3		2											2		2
CLO 4		3		3											
CLO 5		3		3										2	
CLO 6		3		3											2
CLO 7				2										3	

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

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2, PO 4, PO 5	SEE Exams	PO 1, PO 2, PO 4, PO 5	Assignments	-	Seminars	PO 5
Laboratory Practices	PO 1, PO 2, PO 4, PO 5	Student Viva	-	Mini Project	-	Certification	-

XII. ASSESSMENT METHODOLOGIES - INDIRECT

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

XIII. SYLLABUS

LIST OF EXPERIMENTS	
WEEK-l	**BASIC OPERATIONS ON MATRICES.**
To generate matrix and perform basic operation on matrices Using MATLAB Software.	
WEEK-2	**GENERATION OF VARIOUS SIGNALS AND SEQUENCES**
Generation of Various Signals and Sequences (Periodic and a periodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.	
WEEK-3	**OPERATIONS ON SIGNALS AND SEQUENCES SUCH AS ADDITION, MULTIPLICATION, SCALING, SHIFTING, FOLDING, COMPUTATION OF ENERGY AND AVERAGE POWER**
To performs functions on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.	
WEEK-4	**DEMONSTRATION OF GIBB'S PHENOMENON**
To verify the Gibbs Phenomenon	
WEEK-5	**FINDING THE FOURIER TRANSFORM OF GIVEN SIGNAL AND PLOTTING ITS MAGNITUDE AND PHASE SPECTRUM.**
To find the Fourier Transform of a given signal and plotting its magnitude and phase spectrum	
WEEK-6	**PROPERTIES OF FOURIER TRANSFORMS**
To verify the properties of DTFT of a given signal	
WEEK-7	**LOCATING POLES AND ZEROS, AND PLOTTING THE POLE ZERO MAPS IN Z- PLANE FOR A GIVEN TRANSFER FUNCTION**

To locating the zeros and poles and plotting the pole zero maps in Zplane for the given transfer function.	
WEEK-8	**CONVOLUTION BETWEEN SIGNALS AND SEQUENCES**
To find the output with linear convolution operation Using MATLAB Software.	
WEEK-9	**AUTO CORRELATION AND CROSS CORRELATION BETWEEN SIGNALS AND SEQUENCES**
To compute auto correlation and cross correlation between signals and sequences.	
WEEK-l0	**GENERATION OF GAUSSIAN NOISE(REAL & COMPLEX), COMPUTATION OF ITS MEAN, MEAN SQUARE VALUES AND ITS SKEW**
To Verify the Gaussian noise.	
WEEK-l1	**VERIFICATION OF WIENER-KHINCHIN RELATIONS**
Verification of wiener–khinchine relation.	
WEEK-l2	**DISTRIBUTION AND DENSITY FUNCTIONS OF STANDARD RANDOM VARIABLES**
To calculate PDF and CDF of standard random variables	
Text Books:	
1. S. Varadarajan , M. M. Prasada Reddy , M. Jithendra Reddy , "Signals and systems Introduces MATLAB programs", I K International Publishing House Pvt. Ltd, 2016. 2. Scott L. Miller, Donald G. Childers, "Probability and Random Processes: With Application to Signal Processing and communications", Elsevier, 2004.	
Reference Books:	
1. Krister Alperstein, "An Introduction to Mat lab", Book Boon, 2012. 2. K. S. Suresh Kumar, "Electric Circuit Analysis", Pearson Education, 1st Edition, 2013.	

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 (CLOs)	Reference
1	To generate matrix and perform basic operation on matrices Using MATLAB Software.	CLO 1, CLO 2	T1:2.5 & 2.10
2	Generation of Various Signals and Sequences (Periodic and a periodic), such as Unit Impulse, Unit Step, Square, Saw tooth, Triangular, Sinusoidal, Ramp, Sinc.	CLO 2	T1:6.2, 6.3, 6.6
3	To performs functions on signals and sequences such as addition, multiplication, scaling, shifting, folding, computation of energy and average power.	CLO 3	T1:6.1
4	To verify the Gibbs Phenomenon	CLO 11	T1:6.4
5	To find the Fourier Transform of a given signal and plotting its magnitude and phase spectrum	CLO 4	T1:5.2
6	To verify the properties of DTFT of a given signal	CLO 8	T1:5.5
7	To locating the zeros and poles and plotting the pole zero maps in Z-plane for the given transfer function	CLO 9	T1:7.2-7.5
8	To find the output with linear convolution operation Using MATLAB Software.	CLO 5	T1:7.9
9	To compute auto correlation and cross correlation between signals and sequences.	CLO 6	T1:7.8
10	To Verify the Gaussian noise.	CLO 12	T1:5.4
11	Verification of wiener–khinchine relation.	CL07	T1:8.1
12	To calculate PDF and CDF of standard random variables	CLO 10	T1:8.4

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

S No	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Verify a Random Process for Stationary in Wide Sense	Guest Lectures	PO 4	PSO 3
2	Sampling Theorem Verification	NPTEL	PO 5	PSO 3

Prepared by:
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HOD, ECE