INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE DESCRIPTOR

Course Title	**ELECTRICAL ENGINEERING SIMULATION LABORATORY**				
Course Code	**AEE105**				
Programme	B.Tech				
semester	III	EEE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	-	-	-	3	2
Chief Coordinator	**Ms. S Swathi, Assistant Professor, EEE**				
Course Faculty	**Dr. D Shobha Rani, Professor, EEE** **Ms. S Swathi, Assistant Professor, EEE**				

I. COURSE OVERVIEW:

This course introduces the basic concepts of net work theory which is the foundation for all subjects of the electrical engineering discipline. The emphasis of this course is laid on the basic analysis of circuits which includes three phase circuits, transient analysis of DC and AC circuits, network functions, and two port net work parameters, Fourier analysis of AC circuits, design and analysis of filters.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS002	I	Linear Algebra and Ordinary Differential Equations	4
UG	AHS011	II	Mathematical Transform Techniques	4
UG	AEE002	II	Electrical Circuits	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Electrical Engineering Simulation Lab	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
PO1	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.	2	Calculations of the observations
PO2	**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	3	Exercise, Discussion
PO3	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.	3	Term observations
PO5	**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	Exercise, Discussion

3 = High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Level	Proficiency assessed by
PSO1	**Problem Solving Skills:** Able to utilize the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based team work.	2	Exercise, Discussion
PSO2	**Professional Skills:** To explore the scientific theories, ideas, methodologies and the new cutting edge technologies in renewable energy engineering, and use this erudition in their professional development and gain sufficient competence to solve the current and future energy problems universally.	--	--
PSO3	**Modern Tools in Electrical Engineering:** To be able to utilize of technologies like PLC, PMC, process controllers, transducers and HMI and design, install, test, and maintain power systems and industrial applications.	2	videos

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Measure the active and reactive power in a three phase system
II	Draw the locus diagram of electric circuits
III	Calculate the two port network parameters of electric circuit
IV	Understand the transient response of series and parallel circuits
V	Design the low pass and high pass filters and Analyse the basic circuits, waveforms using Fourier transform, Lab View, Visio Software

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
AEE105.01	CLO 1	Measurement of three phase active power and reactive power	PO1, PO2	3
AEE105.02	CLO 2	Plot the locus diagram of series RL and RC circuits.	PO1,PO2	2
AEE105.03	CLO 3	Calculate Z, Y of two port network	PO1, PO2,PO3	3
AEE105.04	CLO 4	Determine ABCD, h parameters of the two port network	PO1, PO2,PO3	3
AEE105.05	CLO 5	Analysis of square wave, half wave rectified and full wave rectified sine wave using Fourier transforms.	PO1, PO2,PO5	2
AEE105.06	CLO 6	Draw the electrical symbols using VISIO software.	PO1,PO5	2
AEE105.07	CLO 7	Study and plot the transient response of series and parallel RL and RC circuits.	PO1, PO2, PO5	2
AEE105.08	CLO 8	Analyze transient response of series and parallel RLC circuit	PO1, PO2, PO5	2
AEE105.09	CLO 9	Design Of Low Pass And High Pass Filters	PO1, PO2,PO3, PO5	2
AEE105.10	CLO 10	Editing and building a VI, creating a sub VI.	PO5	2
AEE105.11	CLO 11	Analyze VIs using FOR loop, WHILE loop, charts and arrays, graph and.	PO1, PO2,PO5	2
AEE105.12	CLO 12	Generate signals of triangular wave, saw tooth, square wave and display of wave form, minimum and maximum values of wave form and modulation.	PO1, PO2,PO5	2
AEE105.13	CLO 13	Display the Three phase sine wave generation	PO1, PO2,PO5	2
AEE105.14	CLO 14	Measure of Frequency using Lissajous figures in LabView.	PO1, PO2,PO5	2
AEE105.15	CLO 15	Explore the knowledge and skills of employability to succeed in national and international level competitive examinations.	P01,PO2,PO3, PO5	2

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											3		
CLO 2	3	2											2		
CLO 3	2	3											3		
CLO 4	2	3											3		
CLO 5	2	3			2								2		2

(CLOs)	Program Outcomes (POs)												Program Specific Outcomes (PSOs)		
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CLO 6	2				2										2
CLO 7	2	3			2								2		2
CLO 8	2	3			2								2		2
CLO 9	2	2	3		2								2		2
CLO 10					2										2
CLO 11	2	2			2								2		2
CLO 12	2	2			2								2		2
CLO 13	2	2			2								2		2
CLO 14	2	2			2								2		2
CLO 15	2	3	3		2								3		2

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT:

CIE Exams	PO1, PO2, PO3, PO5	SEE Exams	PO1, PO2, PO3, PO5	Assignments	PO1, PO2, PO3, PO5	Seminars	PO1, PO2, PO3, PO5
Laboratory Practices	PO1, PO2, PO3, PO5	Student Viva	--	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 EXERCISES	
Week -1	**MEASUREMENT OF THREE PHASE ACTIVE POWER AND REACTIVE POWER**
Measurement of three phase active and reactive power for balanced and unbalanced loads.	
Week - 2	**LOCUS DIAGRAMS**
Plot the locus diagram of series RL and RC circuits.	

Week - 3	**IMPEDANCE(Z) AND ADMITTANCE(Y) PARAMETERS**
To calculate and verify 'Z' parameters and 'Y' parameters of two-port network.	
Week - 4	**TRANSMISSION (ABCD) AND HYBRID(H) PARAMETERS**
To calculate and verify 'ABCD' parameters and 'H' parameters of two-port network.	
Week - 5	**FOURIER ANALYSIS**
Fourier analysis of square wave, half wave rectified and full wave rectified sine wave using MATLAB.	
Week - 6	**ELECTRICAL SYMBOLS USING VISIO SOFTWARE**
Draw the electrical symbols using VISIO software.	
Week - 7	**TRANSIENT RESPONSE OF RL AND RC CIRCUITS USING DIGITAL SIMULATION**
To study and plot the transient response of series and parallel RL and RC circuits using MATLAB.	
Week - 8	**TRANSIENT RESPONSE OF RLC CIRCUITS USING DIGITAL SIMULATION**
To study and plot the transient response of series and parallel RLC circuit using MATLAB.	
Week - 9	**DESIGN OF LOW PASS AND HIGH PASS FILTERS USING DIGITAL SIMULATION**
Simulation of low pass and high pass filters using digital simulation.	
Week - 10	**VIRTUAL INSTRUMENTS (VI) USING LABVIEW**
Editing and building a VI, creating a sub VI.	
Week - 11	**STRUCTURES USING LABVIEW**
Using FOR loop, WHILE loop, charts and arrays, graph and analysis VIs.	
Week - 12	**GENERATION OF COMMON WAVE FORMS USING LABVIEW**
Signal generation of triangular wave, saw tooth, square wave and display of wave form, minimum and maximum values of wave form and modulation.	
Week - 13	**SINE WAVE GENERATION USING LABVIEW**
Three phase sine wave generation and display.	
Week - 14	**FREQUENCY MEASUREMENT USING LABVIEW**
Frequency measurement using Lissajous figures in LabView.	
TEXT BOOKS:	
1. A Chakrabarthy, "Electric Circuits", Dhanpat Rai& Sons, 6th Edition, 2010.	
2.A Sudhakar, Shyammohan S Palli, "Circuits & Networks", Tata McGraw- Hill, 4th Edition, 2010.	
3. Rudrapratap, "Getting Started with MATLAB: A Quick Introduction for Scientists and Engineers",Oxford University Press, 1st Edition, 1999.	
4. Nesimiertugrul, "Labview for electric circuits, machines, drives, and laboratories", prentice hall, 1st Edition, 2002.	
REFERENCES:	
1. John Bird, "Electrical Circuit Theory and technology", Newnes, 2nd Edition, 2003.	
2. Gupta, Gupta & John, "Virtual Instrumentation Using LabVIEW", Tata McGraw-Hill, 1st Edition, 2005.	

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	Measurement of three phase active and reactive power for balanced and unbalanced loads.	CLO1	T2: 9.11 R2:19.8
2	Plot the locus diagram of series RL and RC circuits.	CLO2	T2 : 8.13 R2:15.12
3	To calculate and verify 'Z' parameters and 'Y' parameters of two-port network.	CLO3	T1 :13.6 R2:16.4
4	To calculate and verify 'ABCD' parameters and 'H' parameters of two-port network.	CLO4	T1 :13.9 R2:16.5
5	Fourier analysis of square wave, half wave rectified and full wave rectified sine wave using MATLAB.	CLO5	T2 :12.1 R2:14.5
6	Draw the electrical symbols using VISIO software	CLO6	T2 :12.4 R2:14.6
7	To study and plot the transient response of series and parallel RL and RC circuits using MATLAB	CLO7	T2 :11.2 R2 :17.3
8	To study and plot the transient response of series and parallel RLC circuit using MATLAB.	CLO8	T2 : 11.7 R2:17.6
9	Simulation of low pass and high pass filters using digital simulation.	CLO9	T1: 18.6 R2:19.12
10	Editing and building a VI, creating a sub VI.	CLO10	T1: 18.9 R2:19.15
11	Using FOR loop, WHILE loop, charts and arrays, graph and analysis VIs.	CLO11	T2:12.4 R2:14.8
12	Signal generation of triangular wave, saw tooth, square wave and display of wave form, minimum and maximum values of wave form and modulation.	CLO12	T2:12.4 R2:14.7
13	Three phase sine wave generation and display	CLO13	T2:12.6 R2:14.8
14	Frequency measurement using Lissajous figures in LabView.	CLO14	T2:12.8 R2:14.9

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

S No	Description	Proposed Actions	Relevance With POs	Relevance With PSOs
1	Designing of prototype Filters	Guest Lectures	PO1,PO2, PO5	PSO 1
2	Digital Simulation of Electric Circuits.	Videos	PO1, PO3, PO5	PSO 1
3	Significance of Poles and Zeros.	Term Paper	PO1, PO2	PSO 1

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