INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRONICS AND COMMUNICATION ENGINEERING

COURSE DESCRIPTOR

Course Title	**ELECTRICAL TECHNOLOGY LABORATORY**				
Course Code	AEE114				
Programme	B.Tech				
Semester	III	ECE			
Course Type	Core				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mr. K Devender Reddy, Assistant Professor				
Course Faculty	Dr. V C Jagan Mohan, Assistant Professor Mr. Muralidhar Nayak, Assistant Professor Mr. A Sathish Kumar, Assistant Professor Mr. K Devender Reddy, Assistant Professor				

I. COURSE OVERVIEW:

The objective of the Electrical Technology laboratory is to expose the students to the operation of electrical machines and networks and give them experimental skill. The purpose of lab experiment is to continue to build circuit construction skills using different circuit element and check the performance characteristics of machines. It also aims to introduce MATLAB, a circuit simulation software tool. It enables the students to gain sufficient knowledge on the programming and simulation of Electrical circuits and to operate and find the efficiency of electrical machines.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AHS006	I	Electrical properties and magnetic properties	4
UG	AEE002	II	Basics of circuit analysis and electromagnetism	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Electrical Technology 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	Calculations of the observations
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of	2	Characteristic curves

Program Outcomes (POs)		Strength	Proficiency assessed by
	mathematics, natural sciences, and engineering sciences.		
PO 3	**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.	2	Videos
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
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.	3	Conducting experiments

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.	-	-
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..	2	Videos
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	Apply different techniques used in electric circuit analysis to calculate two port network parameters.
II	Conduct various tests on DC shunt machines to calculate the efficiency and to control speed.
III	Determine the performance characteristics, voltage regulation and efficiency of single phase transformer by conducting various tests.
IV	Demonstrate the transient response of series RL and RC circuits.

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
AEE114.01	CLO 1	Demonstrate the transient response of series RL and RC circuit and obtain the time constant.	PO1, PO2	3
AEE114.02	CLO 2	Understand impedance and admittance parameters along with its governing equations.	PO1, PO2, PO3	2
AEE114.03	CLO 3	Understand transmission and hybrid parameters along with its governing equations.	PO1, PO2, PO3	2
AEE114.04	CLO 4	Understand the open circuit characteristics of DC shunt generator	PO1, PO2	3
AEE114.05	CLO 5	Determine the efficiency of DC shunt generator by conducting load test	PO1, PO2, PO3	2
AEE114.06	CLO 6	Determine the efficiency of DC shunt motor by conducting load test.	PO1, PO2, PO3	2
AEE114.07	CLO 7	Predict the efficiency of DC shunt generator and DC shunt motor without loading the machine.	PO1, PO2, PO4	2
AEE114.08	CLO 8	Study the various speed control techniques of Dc shunt motor	PO1, PO2, PO3	2
AEE114.09	CLO 9	Estimate equivalent circuit parameters, efficiency, and voltage regulation of a single phase transformer by conducting open circuit and short circuit test.	PO1, PO2	3
AEE114.10	CLO 10	Determine the efficiency single phase transformer by directly load test.	PO1, PO2	3
AEE114.11	CLO 11	Understand the transient response of series and parallel RLC circuits using digital simulation .	PO1, PO2, PO5	3
AEE114.12	CLO 12	Analysis of low pass and high pass filters using digital simulation.	PO1, PO2, PO5	3
AEE114.13	CLO 13	Understand open circuit characteristics of DC shunt generator using SIMSCAPE power systems.	PO1, PO2, PO5	3
AEE114.14	CLO 14	Understand load test on DC shunt generator using SIMSCAPE power systems.	PO1, PO2, PO5	3

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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	2													
CLO 2	3	2	2												
CLO 3	3	2	2												
CLO 4	3	2													
CLO 5	3	2	2												
CLO 6	3	2	2												
CLO 7	3	2		2											
CLO 8	3	2	2												
CLO 9	3	2													
CLO 10	3	2													
CLO 11	3	2			2										3
CLO 12	3	2			2										3
CLO 13	3	2			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 14	3	2			2										3

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO1, PO2, PO3, PO4, PO5	SEE Exams	PO1, PO2, PO3, PO4, PO5	Assignments	-	Seminars	-
Laboratory Practices	PO1, PO2, PO3, PO4, PO5	Student Viva	PO1, PO2, PO3, PO4, PO5	Mini Project	-	Certification	-

XII. ASSESSMENT METHODOLOGIES - INDIRECT

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

XIII. SYLLABUS

LIST OF EXERCISES	
Week - 1	**RC AND RL NETWORKS**
Time response of first order RC and RL networks.	
Week - 2	**Z AND Y NETWORKS**
Determination of impedance (Z) and admittance (Y) parameters of two port network.	
Week - 3	**ABCD AND HYBRID PARAMETERS**
Determination of transmission and hybrid parameters of two port network.	
Week – 4	**OPEN CIRCUIT CHARACTERISTICS OF DC SHUNT GENERATOR**
Plot the Magnetization characteristics of a DC shunt generator.	
Week - 5	**LOAD TEST ON DC SHUNT GENERATOR**
Determination of efficiency by conducting load test on DC shunt generator.	
Week - 6	**NO LOAD TEST ON DC SHUNT MACHINE (SWINBURNE‟S TEST)**
Predetermination of efficiency of a DC shunt machine.	
Week – 7	**BRAKE TEST ON DC SHUNT MOTOR**
Study the performance characteristics of DC shunt motor on load.	
Week - 8	**SPEED CONTROL OF DC SHUNT MOTOR**
Study the speed characteristics of a DC shunt motor.	
Week - 9	**OC AND SC TEST ON SINGLE PHASE TRANSFORMER**
Determination of equivalent circuit parameters and plot the performance characteristics of a single phase transformer.	
Week - 10	**LOAD TEST ON SINGLE PHASE TRANSFORMER**
Plot the efficiency of single phase transformer for various loads.	
Week - 11	**TRANSIENT RESPONSE OF RLC CIRCUIT**
Study and plot the transient response of series and parallel RLC circuit using digital simulation.	
Week - 12	**HIGH PASS AND LOW PASS FILTERS**

Analysis of low pass and high pass filters using digital simulation.	
Week - 13	**MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR**
Open circuit characteristics of DC shunt generator using SIMSCAPE power systems.	
Week - 14	**DIRECT TEST ON DC SHUNT GENERATOR**
Load test on DC shunt generator using SIMSCAPE power systems.	

Text books

1. V K Mehta, —"Principles of Electrical Engineering", S Chand Publications, Re print, 2005.
2. I J Nagarath, D P Kothari, —"Theory and Problems of basic electrical engineering", PHI Publications, 1st Edition, 2013.
3. Sudhakar and Shyam Mohan, —Electrical Circuits‖, McGraw Hill Publication, 3rd Edition, 2015.
4. P S Bimbra, —Electrical Machines, Khanna Publishers, New Delhi, 2004

References

1. A Chakrabarhty, —Electric Circuits‖, Dhanipat Rai & Sons Publication 6th Edition, 2010.
2. I J Nagrath, D P Kothari, —Electrical Machines‖, Tata Mc Graw Hill Publication, New Delhi, 2nd Edition, 2010.
3. N C Jagan and C Lakhminaraya, —Network Analysis‖, BS Publications 2nd Edition, 2011.

XIV. COURSE PLAN:

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

Week No	Topics to be covered	CLOs	Reference
1	RC and RL networks	CLO 1	T2: 11.2
2	Z and Y networks	CLO 2	T2: 15.2
3	ABCD and hybrid parameters	CLO 3	T2: 15.6
4	Open circuit characteristics of DC shunt generator	CLO 4	T1: 4.11
5	Load test on DC shunt generator	CLO5	T1: 4.12
6	No load test on DC shunt machine (Swinburne's test)	CLO 6	T1: 4.12
7	Brake test on DC shunt motor	CLO7	T1: 4.14
8	Speed control of DC shunt motor	CLO8	T1: 4.14
9	OC and SC test on single phase transformer	CLO9	T1: 1.7
10	Load test on single phase transformer	CLO10	T1: 1.7
11	Transient response of RLC circuit	CLO 11	T2: 11.4
12	High pass and low pass filters	CLO 12	T2: 17.6
13	Magnetization characteristics of dc shunt generator	CLO13	T1: 4.11
14	Direct test on dc shunt generator	CLO14	T1: 4.12

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

S NO	Description	Proposed actions	Relevance with POs	Relevance with PSOs
1	Design a m- derived filters	NPTEL	PO1, PO3	-
2	Design of image parameters and applications in communication systems	NPTEL	PO1, PO3	-

Prepared by:

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HOD, ECE