INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE DESCRIPTOR

Course Title	**ELECTRICAL MACHINES LABORATORY - I**				
Course Code	**AEEB13**				
Programme	**B.Tech**				
Semester	**III**	**EEE**			
Course Type	**Core**				
Regulation	**IARE - R18**				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	1.5
Chief Coordinator	Mr. A Sathish Kumar, Assistant Professor				
Course Faculty	Mr. A Sathish Kumar, Assistant Professor Mr. K Devender Reddy, Assistant Professor				

I. COURSE OVERVIEW:

The primary objective of this course is to study the various characteristics of DC Machines and to explain the underlying principles and to provide insight on the applications of various types of DC machines and also to assist students to control the various DC machines by using PLC and Lab VIEW.

II. COURSE PRE-REQUISITES:

Level	Course Code	Semester	Prerequisites	Credits
UG	AEEB07	II	Electrical Circuits Laboratory	1.5

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Electrical Machines Laboratory - I	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	**Problem Solving**: Exploit the knowledge of high voltage engineering in collaboration with power systems in innovative, dynamic and challenging environment, for the research based team work.	2	Lab related Exercises
PSO 2	**Professional Skills:** Identify 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.	-	-
PSO 3	**Modern Tools in Electrical Engineering:** Comprehend the technologies like PLC, PMC, process controllers, transducers and HMI and design, install, test, maintain power systems and industrial applications.	-	-

3 = High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES (COs):

The course should enable the students to:	
I	Conduct various tests on DC series and shunt machines.
II	Develop procedure for speed control of DC machines and test with PLC and LabVIEW.
III	Utilize LabVIEW, programmable logic controllers to control various machines.
IV	Simulate DC machine to study the characteristics by using digital simulation

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
AEEB13.01	CLO 1	Identify the different parts of a DC machine and demonstrate the working of each of them.	PO 1 PO 5	3
AEEB13.02	CLO 2	Classify the different types of DC machines and describe the operation of each type of the machine.	PO 1 PO 2	3
AEEB13.03	CLO 3	Draw the magnetization characteristics and explain the importance of residual magnetic flux in self excited generators.	PO 1 PO 5	3
AEEB13.04	CLO 4	Determine the efficiency of a DC shunt, series and compound generator by direct loading.	PO 1 PO 2	2
AEEB13.05	CLO 5	Draw the internal and external characteristics of DC generators	PO 5	2
AEEB13.06	CLO 6	Know the different types of speed control methods for a DC motor.	PO 1 PO 2	2
AEEB13.07	CLO 7	Conduct Swinburne's test on DC shunt motor and predetermine the efficiency of the machine without loading.	PO 2 PO 5	2
AEEB13.08	CLO 8	Determine the efficiency of DC shunt and Compound motors by performing brake test.	PO 5	2
AEEB13.09	CLO 9	Calculate the efficiency of two identical series machines by performing Field's test.	PO 5	2
AEEB13.10	CLO 10	Determine the efficiency of two identical shunt machines by performing Hopkinson's test.	PO 2	2
AEEB13.11	CLO 11	Calculate the efficiency of DC machine by performing retardation test	PO 5	1
AEEB13.12	CLO 12	Classify the different types of losses that occur in a DC machine and separate the core losses of a DC shunt machine with a suitable experiment.	PO 1	3
AEEB13.13	CLO 13	Know the applications of each type of DC machine and use them in real time applications.	PO 5	1
AEEB13.14	CLO 14	Describe the importance of MATLAB software in simulating and predicting the performance of DC machines.	PO 5	1

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		

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 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					1										2
CLO 14					1										2

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2 PO 5	SEE Exams	PO 1, PO 2 PO 5	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2 PO 5	Student Viva	PO 1, PO 2 PO 5	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	**OPEN CIRCUIT CHARACTERISTICS OF DC SHUNT GENERATOR**
Magnetization characteristics of DC shunt generator.	
Week-2	**LOAD TEST ON DC SHUNT GENERATOR**
Determination of efficiency by load test in DC shunt generator	
Week-3	**LOAD TEST ON DC SERIES GENERATOR**
Determination of efficiency by load test on DC series generator.	

Week-4	**LOAD TEST ON DC COMPOUND GENERATOR**
Determination of efficiency by load test on DC compound generator.	
Week-5	**HOPKINSON'S TEST**
Study the performance characteristics of two identical DC shunts machines.	
Week-6	**FIELD'S TEST**
Study the performance characteristics of two identical DC series machines	
Week-7	**SWINBURNE'S TEST AND SPEED CONTROL OF DC SHUNT MOTOR**
Predetermine the efficiency and study the characteristics of DC shunt machine with different speed control techniques	
Week-8	**BRAKE TEST ON DC COMPOUND MOTOR**
Study the performance characteristics of DC compound motor	
Week-9	**BRAKE TEST ON DC SHUNT MOTOR**
Study the performance characteristics of DC shunt motor by brake test	
Week-10	**RETARDATION TEST**
Study the performance characteristics by using retardation test on DC shunt motor	
WeeK-11	**SEPARATION OF LOSSES IN DC SHUNT MOTOR**
Study the method used for separation of losses in DC shunt motor.	
Week-12	**MAGNETIZATION CHARACTERISTICS OF DC SHUNT GENERATOR**
Study the magnetization characteristics of DC shunt generator using digital simulation	
Week 13	**LOAD TEST ON DC SHUNT GENERATOR USING DIGITAL SIMULATION**
Perform the load test on DC shunt generator using digital simulation	
Week 14	**SPEED CONTROL OF DC SHUNT MOTOR USING DIGITAL SIMULATION**
Verify the speed control techniques of DC motor using digital simulation	

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	Magnetization characteristics of DC shunt generator	CLO 1	T1-2.1 to 2.7
2	Determination of efficiency by load test in DC shunt generator	CLO 2	T1-20.1 to 20.2
3	Determination of efficiency by load test on DC series generator.	CLO 3	T1-8.1 to 8.2
4	Determination of efficiency by load test on DC compound generator.	CLO 4	T1–8.3 to 8.7
5	Study the performance characteristics of two identical DC shunts machines	CLO 5	T1-10.1 to 10.10
6	Study the performance characteristics of two identical DC series machines	CLO 6	T1-10.11 to10.13
7	Predetermine the efficiency and study the characteristics of DC shunt machine with different speed control techniques	CLO 7	T1-11.1 to 11.5

Week No.	Topics to be covered	Course Learning Outcomes	Reference
8	Study the performance characteristics of DC compound motor	CLO 8	T1 –11.12
9	Study the performance characteristics of DC shunt motor by brake test	CLO 9	T1–17.1 to 17.6
10	Study the performance characteristics by using retardation test on DC shunt motor	CLO 10	T1–14.1 to 14.3
11	Study the method used for separation of losses in DC shunt motor	CLO 11	T1-14.9
12	Study the magnetization characteristics of DC shunt generator using digital simulation	CLO 12	T1-19.1 to 19.3

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	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 5	PSO 1

Prepared by:
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