INSTITUTE OF AERONAUTICAL ENGINEERING
(Autonomous)

Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

COURSE DESCRIPTOR

Course Title	**BASIC ELECTRICAL AND ELECTRONICS LABORATORY**				
Course Code	AEEB08				
Programme	B.Tech				
Semester	II	ME			
Course Type	Foundation				
Regulation	IARE - R18				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	1.5
Chief Coordinator	Ms. B. Navothna, Assistant Professor, EEE				
Course Faculty	Ms. B. Navothna, Assistant Professor, EEE Ms. B. Manogna, Assistant Professor, EEE				

I. COURSE OVERVIEW:

The aim of this course is to conduct experiments on basic concepts of electrical circuits and it is further extended to cover the application of basic concepts by the inclusion of series and parallel electrical circuits. The course deals with the alternating quantities and DC machines, AC machines in power stations. This course includes experiments deal with the study of characteristics of electronic components.

II. COURSE PRE-REQUISITES:

Level	Course code	Semester	Prerequisites	Credits
-	-	-	-	-

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total marks
Basic Electrical and Electronics laboratory	70 Marks	30 Marks	100

IV. DELIVERY / INSTRUCTIONAL METHODOLOGIES:

X	Chalk & talk	X	Quiz	X	Assignments	X	MOOCs
√	LCD / PPT	X	Seminars	X	Mini project	X	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		**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.	3	Calculations of the observations

Program Outcomes		Strength	Proficiency assessed by
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	Characteristic curves
PO4	**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	Conducting experiments

3= High; 2 = Medium; 1 = Low

VII. HOW PROGRAM SPECIFIC OUTCOMES ARE ASSESSED:

Program Specific Outcomes		Strength	Proficiency assessed by
PSO1	**Professional Skills:** To produce engineering professional capable of synthesizing and analyzing mechanical systems including allied engineering streams.	-	-
PSO2	**Modelling and Simulation Practices:** An ability to adopt and integrate current technologies in the design and manufacturing domain to enhance the employability.	2	Term observations
PSO3	**Successful Career and Entrepreneurship:** To build the nation, by imparting technological inputs and managerial skills to become Technocrats.	-	-

3= High; 2 = Medium; 1 = Low

VIII. COURSE OBJECTIVES:

The course should enable the students to:	
I	Analyze the basic concepts of electrical circuits.
II	Study the performance of DC machines and AC machines.
III	Understand the characteristics of electronic components.

IX. COURSE OUTCOMES(COs):

COs	Course Outcome	CLOs	Course Learning Outcome
CO 1	Analyze the basic concepts of electricity, applications of Kirchhoff laws	CLO 1	Understand the application of basic concept of electrical circuits KCL and KVL in series and parallel circuits.
		CLO 2	Understand the basic concept of electrical circuits Ohm's law
CO 2	Study the performance characteristics of DC machines	CLO 3	Draw the performance characteristics of DC shunt generator.
		CLO 4	Calculate the performance analysis in DC shunt machine as both generator and motor by Swinburne's test.
		CLO 5	Calculate the performance analysis in single phase transformer.
CO 3	Analyze the performance	CLO 6	Draw and analysis of performance characteristics of three phase induction motor by brake test.

COs	Course Outcome	CLOs	Course Learning Outcome
	characteristics of AC machines	CLO 7	Determine the regulation of alternator using synchronous impedance method.
CO 4	Demonstrate the working of rectifiers and study the performance characteristics of diodes	CLO 8	Draw and analysis of performance characteristics of PN junction diode.
		CLO 9	Draw and analysis of performance characteristics of Zener diode
		CLO 10	Demonstrate practical understanding of Half wave rectifier.
		CLO 11	Demonstrate practical understanding of Full wave rectifier.
CO 5	Understand the working of transistor and analyze its characteristics.	CLO 12	Draw and analysis of performance characteristic curves of common emitter transistor.
		CLO 13	Draw and analysis of performance characteristic curves of common base transistor
		CLO 14	Demonstrate practical understanding of CRO

X. COURSE LEARNING OUTCOMES:

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's mapped	Strength of mapping
AEEB08.01	CLO 1	Understand the application of basic concept of electrical circuits KCL and KVL in series and parallel circuits.	PO1, PO2	2
AEEB08.02	CLO 2	Understand the basic concept of electrical circuits Ohm's law	PO1, PO2	2
AEEB08.03	CLO 3	Draw the performance characteristics of DC shunt generator.	PO1	3
AEEB08.04	CLO 4	Calculate the performance analysis in DC shunt machine as both generator and motor by Swinburne's test.	PO1, PO4	3
AEEB08.05	CLO 5	Calculate the performance analysis in single phase transformer.	PO1, PO4	3
AEEB08.06	CLO 6	Draw and analysis of performance characteristics of three phase induction motor by brake test.	PO1, PO4	2
AEEB08.07	CLO 7	Determine the regulation of alternator using synchronous impedance method.	PO1, PO2	2
AEEB08.08	CLO 8	Draw and analysis of performance characteristics of PN junction diode.	PO1, PO4	2
AEEB08.09	CLO 9	Draw and analysis of performance characteristics of Zener diode	PO1, PO4	2
AEEB08.10	CLO 10	Demonstrate practical understanding of Half wave rectifier.	PO1	3
AEEB08.11	CLO 11	Demonstrate practical understanding of Full wave rectifier.	PO1	3
AEEB08.12	CLO 12	Draw and analysis of performance characteristic curves of common emitter transistor.	PO1, PO4	2
AEEB08.13	CLO 13	Draw and analysis of performance characteristic curves of common base transistor	PO1, PO4	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's mapped	Strength of mapping
AEEB08.14	CLO 14	Demonstrate practical understanding of CRO	PO1	2

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XI. MAPPING COURSE OUTCOMES LEADING TO THE ACHIEVEMENT OF PROGRAM OUTCOMES

Course Outcomes (COs)	Program Outcomes (POs)				
	PO1	PO2	PO3	PO4	PSO2
CO 1	2	2			2
CO 2	3			3	2
CO 3	2	2		2	
CO 4	2			2	2
CO 5	2			2	

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

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XIII. ASSESSMENT METHODOLOGIES – DIRECT:

CIE Exams	PO 1, PO 2	SEE	PO1 PO2 PO4	Assignments	-	Seminars	-

	PO 4	Exams					
Laboratory practices	PO 1, PO 2 PO 4, PSO 2	Student viva	PO1	Mini project	-	Certification	-
Term paper	-						

XIV. ASSESSMENT METHODOLOGIES – INDIRECT:

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

XV. SYLLABUS:

LIST OF EXPERIMENTS	
Week-1	**KCL AND KVL**
Verification of Kirchhoff's current and voltage laws	
Week-2	**OHMS LAW**
Verification of ohms law	
Week-3	**MAGNETIZATION CHARACTERISTICS**
Magnetization characteristics of DC shunt generator	
Week-4	**SWINBURNE'S TEST**
Swinburnes test on DC shunt machine	
Week-5	**OPEN CIRCUIT & SHORT CIRCUIT TEST**
Open circuit and short circuit test on single phase transformer	
Week-6	**BRAKE TEST**
Study the performance characteristics of three phase induction motor by brake test.	
Week-7	**SYNCHRONOUS IMPEDENCE METHOD**
Determine the regulation of alternator using synchronous impedance method.	
Week-8	**PN JUNTION DIODE**
PN junction diode characteristics.	
Week-9	**ZENER DIODE**
Zener diode characteristics	
Week-10	**HALF WAVE RECTEFIER**
Half wave rectifier circuit	
WeeK-11	**FULL WAVE RECTIFIER**
Full wave rectifier circuit.	
Week-12	**COMMON EMITTER**
Transistor common emitter characteristics	

Week-13	**COMMON BASE**
Transistor common base characteristics	
Week-14	**CRO**
Study of CRO	

Text Books:

1. Chakrabarti, "Circuit Theory", Dhanpat Rai Publications, 6th Edition, 2004
2. K S Suresh Kumar, "Electric Circuit Analysis", Pearson Education, 1st Edition, 2013
3. Willianm Hayt, Jack E Kemmerly S M Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 7th Edition, 2010
4. J P J Millman, C C Halkias, Satyabrata Jit, "Millman''s Electronic Devices and Circuits", Tata McGraw Hill,2nd Edition, 1998
5. R L Boylestad, Louis Nashelsky, "Electronic Devices and Circuits", PEI / PHI, 9th Edition, 2006

Reference Books:

1. David A Bell, "Electric Circuits", Oxford University Press, 9th Edition, 2016
2. U A Bakshi, Atul P Godse "Basic Electrical and Electronics Engineering", Technical Publications, 9th Edition, 2016.
3. A Bruce Carlson, "Circuits", Cengage Learning, 1st Edition, 2008.
4. M Arshad, "Network Analysis and Circuits", Infinity Science Press, 9th Edition, 2016.

XVI. COURSE PLAN:

The course plan is meant as a guideline. There may probably be changes.

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	References
1-3	Verification of Kirchhoff's current and voltage laws	CLO 1	T2:1.12 R2:1.7,1.8
4-6	Verification of ohms law	CLO 2	T2:1.9 R2:1.5
7-9	Magnetization characteristics of DC shunt generator	CLO 3	T2: 7.6.3 R2:5.10,5.11
10-12	Swinburnes test on DC shunt machine	CLO 4	T2: 7.7.6 R2:5.21,5.22
13-15	Open circuit and short circuit test on single phase transformer	CLO 5	T2: 6.9-6.10 R2:6.13
16-18	Study the performance characteristics of three phase induction motor by brake test.	CLO 6	T2: 9.3.1 R2:7.8
19-21	Determine the regulation of alternator using synchronous impedance method.	CLO 7	T2: 8.8 R2:7.21
22-24	PN junction diode characteristics.	CLO 8	T4: 4.11 R2:8.1
25-27	Zener diode characteristics	CLO 9	T4:4.19,5.2 R2:8.22.5
28-30	Half wave rectifier circuit	CLO 10	T4: 4.23 R2:8.8,8.17,
31-33	Full wave rectifier circuit.	CLO 11	T4: 4.23 R2:8.8,8.18
34-36	Transistor common emitter characteristics	CLO 12	T4: 6.6 R2:9.21

Lecture No	Topics to be covered	Course Learning Outcomes (CLOs)	References
37-39	Transistor common base characteristics.	CLO 13	T4: 6.6 R2:9.21,9.22
40-42	Study of CRO	CLO 14	R2: 2.2-2.6

XVII. 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	PO1, PO4	PSO2
2	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO2	PSO2

Prepared by:
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