INSTITUTE OF AERONAUTICAL ENGINEERING

(Autonomous)
Dundigal, Hyderabad -500 043

MECHANICAL ENGINEERING

COURSE DESCRIPTOR

Course Title	**BASIC ELECTRICAL AND ELECTRONICS ENGINEERING LABORATORY**				
Course Code	AEE103				
Programme	B.Tech				
Semester	III	AE | ME			
Course Type	Foundation				
Regulation	IARE - R16				
Course Structure	**Theory**			**Practical**	
	Lectures	**Tutorials**	**Credits**	**Laboratory**	**Credits**
	3	1	4	3	2
Chief Coordinator	Mrs. T. Saritha Kumari, Assistant Professor				
Course Faculty	Mrs. T. Saritha Kumari, Assistant Professor Mr. N. Shiva Prasad, Assistant Professor				

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
UG	AHSB02	I	Linear Algebra and Calculus	4

III. MARKS DISTRIBUTION:

Subject	SEE Examination	CIA Examination	Total Marks
Basic Electrical and Electronics Engineering 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 mathematics, natural sciences, and engineering sciences.	3	Characteristic curves
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	Discussion
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

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:** To produce engineering professional capable of synthesizing and analyzing mechanical systems including allied engineering streams.	2	Presentation on real-world problems
PSO 2	**Problem solving skills:** An ability to adopt and integrate current technologies in the design and manufacturing domain to enhance the employability.	2	Discussion
PSO 3	**Successful career and Entrepreneurship:** To build the nation, by imparting technological inputs and managerial skills to become technocrats.	1	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 basic concepts of electrical circuits.
II	Study the performance of DC machines and AC machines.
III	Understand the characteristics of electronic components.

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
AEEB08.01	CLO 1	Understand the application of basic concept of electrical circuits KCL and KVL in series and parallel circuits.	PO 1,PO 2	2
AEEB08.02	CLO 2	Understand the basic concept of electrical circuits Ohm's law.	PO 1,PO 2	2

CLO Code	CLO's	At the end of the course, the student will have the ability to:	PO's Mapped	Strength of Mapping
AEEB08.03	CLO 3	Draw the performance characteristics of DC shunt generator.	PO 1	3
AEEB08.04	CLO 4	Calculate the performance analysis in DC shunt machine as both generator and motor by Swinburne's test.	PO 1, PO 4	3
AEEB08.05	CLO 5	Calculate the performance analysis in single phase transformer.	PO 1, PO 4	3
AEEB08.06	CLO 6	Draw and analysis of performance characteristics of three phase induction motor by brake test.	PO 1, PO 4	2
AEEB08.07	CLO 7	Determine the regulation of alternator using synchronous impedance method.	PO 1,PO 2	2
AEEB08.08	CLO 8	Draw and analysis of performance characteristics of PN junction diode.	PO 1, PO 4	1
AEEB08.09	CLO 9	Draw and analysis of performance characteristics of Zener diode.	PO 1, PO 4	1
AEEB08.10	CLO 10	Demonstrate practical understanding of Half wave rectifier.	PO 1	3
AEEB08.11	CLO 11	Demonstrate practical understanding of Full wave rectifier.	PO 1	3
AEEB08.12	CLO 12	Draw and analysis of performance characteristic curves of common emitter transistor.	PO 1, PO 4	2
AEEB08.13	CLO 13	Draw and analysis of performance characteristic curves of common base transistor.	PO 1, PO 4	2
AEEB08.14	CLO 14	Demonstrate practical understanding of CRO.	PO 1	2

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	2	2												2	1
CLO 2	2	2												2	
CLO 3	3												1		
CLO 4	1			3										1	
CLO 5	1			3										1	
CLO 6	1			2											
CLO 7	1	2													
CLO 8	1			1											
CLO 9	1			1											

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 10	3													1	
CLO 11	3													1	
CLO 12	1			2											
CLO 13	1			2											
CLO 14	2														

3 = High; 2 = Medium; 1 = Low

XI. ASSESSMENT METHODOLOGIES – DIRECT

CIE Exams	PO 1, PO 2 PO 4	SEE Exams	PO 1, PO 2 PO 4	Assignments	-	Seminars	-
Laboratory Practices	PO 1, PO 2 PO 4, PSO 2	Student Viva	PO 1	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-1	**KCL & 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**
Swinburne's 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 IMPEDANCE METHOD**
Determine the regulation of alternator using synchronous impedance method.	
Week-8	**PN JUNCION DIODE**
PN junction diode characteristics.	
Week-9	**ZENER DIODE**
Zener diode characteristics.	
Week-10	**HALF WAVE RECTIFIER**
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. A 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.
6. 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, 9 th Edition, 2016.

Web References:

1. https://www.kuet.ac.bd/webportal/ppmv2/uploads/1364120248DC%20Machines2.pdftextofvideo.nptel.iitm.ac.in
2. https://www.eleccompengineering.files.wordpress.com/2014/08/a-textbook-of-electrical-technology volume-ii-ac-and-dc-machines-b-l-thferaja.pdf
3. https://www.geosci.uchicago.edu/~moyer/GEOS24705/Readings/Klempner_Ch1.pdf
4. https://www.ibiblio.org/kuphaldt/electricCircuits/DC/DC.pdf
5. https://www.users.ece.cmu.edu/~dwg/personal/sample.pdf.

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	Verification of Kirchhoff's current and voltage laws.	CLO 1	T2:1.12 & 2.6 R2:1.7,1.8&1.14
2	Verification of ohms law.	CLO 2	T2:1.9 R2:1.5
3	Magnetization characteristics of DC shunt generator.	CLO 3	T2: 7.6.3 R2:5.10,5.11,5.12 ,5.13,5.14
4	Swinburne's test on DC shunt machine.	CLO 4	T2: 7.7.6 R2:5.21,5.22,5.23,5. 24
5	Open circuit and short circuit test on single phase transformer.	CLO 5	T2: 6.9-6.10 R2:6.13&6.15
6	Study the performance characteristics of three phase induction motor by brake test.	CLO 6	T2: 9.3.1 R2:7.8
7	Determine the regulation of alternator using synchronous impedance method.	CLO 7	T2: 8.8 R2:7.21
8	PN junction diode characteristics.	CLO 8	T4: 4.11 R2:8.1
9	Zener diode characteristics.	CLO 9	T4:4.19,5.2 R2:8.22.5
10	Half wave rectifier circuit.	CLO 10	T4: 4.23 R2:8.8,8.17,
11	Full wave rectifier circuit.	CLO 11	T4: 4.23 R2:8.8,8.18
12	Transistor common emitter characteristics.	CLO 12	T4: 6.6 R2:9.21,9.22,9.23
13	Transistor common base characteristics.	CLO 13	T4: 6.6 R2:9.21,9.22,9.23
14	Study of CRO.	CLO 14	R2: 2.2-2.6

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 4	PSO 1
2	Encourage students to solve real time applications and prepare towards competitive examinations.	NPTEL	PO 2	PSO 1

Prepared by:

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HOD, FRESHMAN ENGINEERING