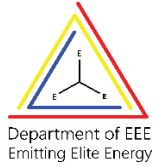




A T M E
College of Engineering



Department of Electrical and Electronics Engineering

Laboratory Manual

Transformers and Generators Laboratory

1BEEL306

Academic Year: 2026-27

Semester: III



Compiled by

Verified by

Approved by

ATME College of Engineering

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Institutional Vision and Mission

Vision:

Development of academically excellent, culturally vibrant, socially responsible and globally competent human resources.

Mission:

- To keep pace with advancements in knowledge and make the students competitive and capable at the global level.
- To create an environment for the students to acquire the right physical, intellectual, emotional and moral foundations and shine as torchbearers of tomorrow's society.
- To strive to attain ever-higher benchmarks of educational excellence.

Department Vision and Mission

Vision:

To create Electrical and Electronics Engineers who excel to be technically competent and fulfill the cultural and social aspirations of the society.

Mission:

- To provide knowledge to students that builds a strong foundation in the basic principles of electrical engineering, problem solving abilities, analytical skills, soft skills and communication skills for their overall development.
- To offer outcome based technical education.
- To encourage faculty in training & development and to offer consultancy through research & industry interaction.

Program Educational Objectives (PEOs)

PEO1: To produce competent and ethical Electrical and Electronics Engineers who will exhibit the necessary technical and managerial skills to perform their duties in society.

PEO2: To make students continuously acquire and enhance their technical and socio-economic skills.

PEO3: To aspire students on R&D activities leading to offering solutions and excel in various career paths.

PEO4: To produce quality engineers who have the capability to work in teams and contribute to real time projects.

Program Outcomes (POs)

PO1	Engineering Knowledge: Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization to develop solutions to complex engineering problems.
PO2	Problem Analysis: Identify, formulate, review research literature and analyse complex engineering problems reaching substantiated conclusions with consideration for sustainable development.
PO3	Design/Development of Solutions: Design creative solutions for complex engineering problems and design/develop systems, components or processes to meet identified needs with consideration for public health and safety, whole-life cost, net-zero carbon, culture, society and environment.
PO4	Conduct Investigations of Complex Problems: Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modelling, analysis and interpretation of data to provide valid conclusions.
PO5	Engineering Tool Usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools, including prediction and modelling, recognizing their limitations to solve complex engineering problems.
PO6	The Engineer and The World: Analyse and evaluate societal and environmental aspects while solving complex engineering problems for their impact on sustainability with reference to economy, health, safety, legal framework, culture and environment.
PO7	Ethics: Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national and international laws.

PO8	Individual and Collaborative Team Work: Function effectively as an individual, and as a member or leader in diverse/multidisciplinary teams.
PO9	Communication: Communicate effectively and inclusively within the engineering community and society at large, including effective reports, design documentation and presentations considering cultural, language and learning differences.
PO10	Project Management and Finance: Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.
PO11	Life-Long Learning: Recognize the need for, and have the preparation and ability for independent and life-long learning, adaptability to new and emerging technologies, and critical thinking in the broadest context of technological change.

Program Specific Outcomes (PSOs)

The students will develop an ability to produce the following engineering traits:

PSO1: Apply the concepts of Electrical & Electronics Engineering to evaluate the performance of power systems and also to control industrial drives using power electronics.

PSO2: Demonstrate the concepts of process control for Industrial Automation, design models for environmental and social concerns and also exhibit continuous self- learning.

Transformers and Generators Lab

COURSE MODULES OF THE SUBJECT TAUGHT FOR THE SESSION ODD SEM 2026-27

Course Code	1BEEL306	Scheme	2025
Type of Course	Professional Core Course Lab	Semester	III
Teaching Hours/Week (L:T:P)	0:0:2	CIE Marks	50
Total Hours of Pedagogy L:T:P: (SL&TW)	0:0:28:2	SEE Marks	50
Credits	01	Total Marks	100
Examination type (SEE)	Practical	Exam Hours	3

Laboratory Course Outcomes

- CO1:** Conduct standard tests on single-phase and three-phase transformers and determine equivalent circuit parameters and performance.
- CO2:** Analyse the performance of transformers under different operating conditions.
- CO3:** Perform experimental investigations on synchronous generators and determine their performance.
- CO4:** Evaluate the voltage regulation of synchronous generators using different standard methods and compare the results obtained.
- CO5:** Determine the steady-state operating characteristics of synchronous generators.

Sl. No.	List of Experiment
1	Open-circuit and short-circuit tests on a single-phase step-up/step-down transformer and predetermination of: (i) Efficiency and regulation, and (ii) Parameters of the equivalent circuit.
2	Polarity Test and Star-Delta Connection of Three Single-Phase Transformers with Efficiency and Regulation under Balanced Load.
3	Determination of Combined and Individual Transformer Efficiencies using Sumpner's Test.
4	Parallel operation of two dissimilar single-phase transformers of different kVA ratings and determination of load sharing
5	Separation of hysteresis and eddy current losses in a single-phase transformer
6	Comparison of performance of three single-phase transformers in delta-delta and V-V (open-delta) connections under load
7	Scott connection for conversion of 3 phase supply to 2 phase supply and plot of secondary side voltages with respect to load variation
8	Direct load test on a three-phase synchronous generator to determine efficiency and regulation
9	Determination of voltage regulation of an alternator by the EMF and MMF method
10	Determination of power-angle characteristics of a synchronous generator and determination of maximum power developed
11	Performance of a synchronous generator connected to an infinite bus under constant load and variable excitation
12	Slip test and determination of X_d and X_q .



CO-PO-PSO Mapping Matrix

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2
CO1	3	3	1	3	3	1	—	1	1	—	2	3	1
CO2	3	3	2	3	3	1	—	1	1	1	2	3	1
CO3	3	3	1	3	3	1	—	1	1	—	2	3	1
CO4	3	3	1	3	3	1	—	1	1	—	2	3	1
CO5	3	3	2	3	3	2	—	1	1	1	2	3	2

Syllabus

Transformers and Generators Laboratory

Course Code: 1BEEL306

Hrs/week:03

Total Hours:42

IAMarks: 50

ExamHours:03

ExamMarks: 50

Sl No.	Name of the Experiment
1	Open-circuit and short-circuit tests on a single-phase step-up/step-down transformer and predetermination of: (i) Efficiency and regulation, and (ii) Parameters of the equivalent circuit.
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11	Performance of a synchronous generator connected to an infinite bus under constant load and variable excitation
12	Slip test and determination of X_d and X_q .

List of Textbooks:

1. Electric Machines, D. P. Kothari, et al, 4th Edition, 2011.
2. Electric Machines, Ashfaq Hussain, Dhanpat Rai & Co, 2nd Edition, 2013.
3. Electric Machinery, P.S. Bimbhra, Khanna Publishers.
4. Theory & Performance of Electrical Machine, J.B. Gupta, S.K. Kataria & Sons.

Transformers and Generators Laboratory

Cycle of Experiments

Sl. No	Experiment Name
Cycle-01	
1	Open-circuit and short-circuit tests on a single-phase step-up/step-down transformer and predetermination of: (i) Efficiency and regulation, and (ii) Parameters of the equivalent circuit.
2	Separation of hysteresis and eddy current losses in a single-phase transformer
3	Polarity Test and Star–Delta Connection of Three Single-Phase Transformers with Efficiency and Regulation under Balanced Load.
4	Determination of Combined and Individual Transformer Efficiencies using Sumpner's Test.
5	Parallel operation of two dissimilar single-phase transformers of different kVA ratings and determination of load sharing
6	Comparison of performance of three single-phase transformers in delta–delta and V–V (open-delta) connections under load
Cycle-2	
7	Scott connection for conversion of 3 phase supply to 2 phase supply and plot of secondary side voltages with respect to load variation
8	Direct load test on a three-phase synchronous generator to determine efficiency and regulation
9	Determination of voltage regulation of an alternator by the EMF and MMF method
10	Determination of power-angle characteristics of a synchronous generator and determination of maximum power developed
11	Performance of a synchronous generator connected to an infinite bus under constant load and variable excitation
12	Slip test and determination of X_d and X_q .

Table of Contents

Exp NO.	Name of The Experiments	Page Nos.
1	Open-circuit and short-circuit tests on a single-phase step-up/step-down transformer and predetermination of: (i) Efficiency and regulation, and (ii) Parameters of the equivalent circuit.	
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Caution

1. Do not play with electricity.
2. Carelessness not only destroys the valuable equipment in the lab but also costs your life.
3. Mere conducting of the experiments without a clear knowledge of the theory is of no value.
4. Before you close a switch, think of the consequences.
5. Do not close the switch until the faculty in charge checks the circuit.

General Instructions to Students

1. Students should come with thorough preparation for the experiment to be conducted.
2. Students will not be permitted to attend the laboratory unless they bring the practical record fully completed in all respects pertaining to the experiment conducted in the previous class.
3. Name plate details including the serial number of the machine used for the experiment should be invariably recorded.
4. Experiment should be started only after the staff-in-charge has checked the circuit diagram.
5. All the calculations should be made in the observation book. Specimen calculations for one set of readings have to be shown in the practical record.
6. Wherever graphs are to be drawn, A-4 size graphs only should be used and the same should be firmly attached to the practical record.
7. Practical record should be neatly maintained.
8. They should obtain the signature of the staff-in-charge in the observation book after completing each experiment.
9. Theory regarding each experiment should be written in the practical record before procedure in your own words