Department of Electrical and Electronics Engineering

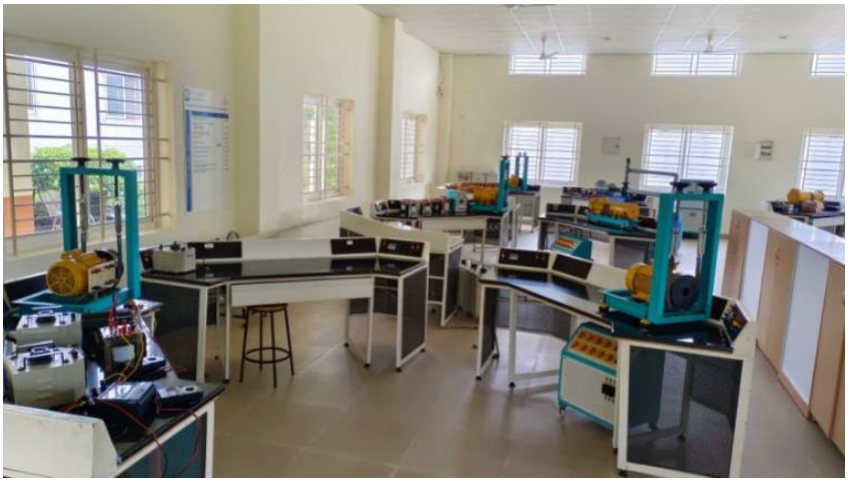
Laboratory Manual

Transformers and Generators Laboratory

BEEL305

Academic Year: 2025-26

Semester: III



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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)

Engineering Graduates will be able to:

PO1: Engineering Knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems

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.

PO3: 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.

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.

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.

PO6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and team work: Function effectively as an individual and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10: Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11: Project management and finance: Demonstrate knowledge and understanding of the engineering management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12: Life-long learning: Recognize the need for and have the preparation and ability to engage in independent and lifelong learning 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.

ATME College of Engineering

Department of EEE
Emitting Elite Energy

Syllabus

Transformers and Generators Laboratory

Course Code:BEEL305 **IAMarks: 50**
Hrs/week:03 **ExamHours:03**
Total Hours:42 **ExamMarks: 50**

Sl No.	Name of the Experiment
1	Open Circuit and Short circuit tests on single phase step up or step down transformer and predetermination of (i) Efficiency and regulation (ii) Calculation of parameters of equivalent circuit.
2	Sumpner's test on similar transformers and determination of combined and individual transformer efficiency.
3	Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load sharing and analytical verification given the Short circuit test data
4	Polarity test and connection of 3 single-phase transformers in star – delta and determination of efficiency and regulation under balanced resistive load.
5	Comparison of performance of 3 single-phase transformers in delta – delta and V – V (open delta) connection under load.
6	Separation of hysteresis and eddy current losses in single phase transformer
7	Investigate the voltage and current ratios of a multi-tapped transformer and verify the ideal transformer ratio
8	Voltage regulation of an alternator by EMF and MMF methods.
9	Power angle curve of synchronous generator or Direct load test on three phase synchronous generator to determine efficiency and regulation.
10	Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice - versa.
11	Simulate power angle curve of generator in MATLAB
12	Model transformer in Simscape for Automatic Voltage Regulation.

List of Textbooks:

1. Electrical Machinery by P S Bhimra
2. Electrical machines by I J Nagrath and Kothari
3. AC and DC machines by B L Thereja

Transformers and Generators Laboratory

Cycle of Experiments

Sl. No	Experiment Name	POs	COs
	Cycle 1		
1	Open Circuit and Short circuit tests on single phase step up or step-down transformer and predetermination of (i) Efficiency and regulation (ii) Calculation of parameters of equivalent circuit.	1,2,3,4,9, 12	CO1
2	Model transformer in Simscape for Automatic Voltage Regulation.	1,2,3,4,5,9, 12	CO2
3	Sumpner's test on similar transformers and determination of combined and individual transformer efficiency.	1,2,3,4,5,9 ,12	CO2
4	Parallel operation of two dissimilar single-phase transformers of different kVA and determination of load sharing and analytical verification given the Short circuit test data	1,2,3,4,9, 12	CO3
5	connection of 3 single-phase transformers in Star – delta and determination of efficiency and regulation under balanced resistive load.	1,2,3,4,9, 12	CO5
6	Separation of hysteresis and eddy current losses in single phase transformer	1,2,3,4,9, 12	CO1
7	Polarity test and investigate the voltage and current ratios of a multi-tapped transformer and verify the ideal transformer ratio	1,2,3,4,9, 12	CO4
	Cycle 2		
8	Comparison of performance of 3 single-phase transformers in delta – delta and V – V (open delta) connection under load.	1,2,3,4,9, 12	CO5
9	Power angle curve of synchronous generator or Direct load test on three phase synchronous generator to determine efficiency and regulation	1,2,3,4,5,9, 12	CO2
10	Simulate power angle curve of generator in MATLAB.	1,2,3,4,5,9 ,12	CO2
11	Voltage regulation of an alternator by EMF and MMF methods.	1,2,3,4,9, 12	CO6
12	Performance of synchronous generator connected to infinite bus, under constant power and variable excitation & vice - versa.	1,2,3,4,9, 12	CO7

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