

ECE 31300 – Energy Conversion Laboratory

Type of Course

Elective for EE program

Catalog Description

Laboratory experiments in energy conversion including operation, testing, and applications of energy conversion machines including AC and DC motors and generators; experiments on magnetic circuits and transformers

Credits

1

Contact Hours

3

Co-requisite Courses

ECE 32400

Prerequisites by Topics

Basic understanding of AC and DC analysis of circuits, the design and analysis of basic electronic circuits, frequency response of circuits, power concept, and electromagnetism.

Textbook

Laboratory Experiment Notes

Course Objectives

This course will provide a basic understanding of magnetic circuits and their losses, single and three phase transformers, including voltage regulation and efficiency. Energy conversion principles, analysis and understanding of generators and motors will be discussed. Application of these concepts for dc and synchronous machines will be demonstrated. Their application to energy sustainability is also discussed. Several projects are included in which students design, simulate, build, test, and report on their findings.

Course Outcomes

Students who successfully complete this course will have demonstrated:

1. An ability to solve magnetic circuits, three phase and single phase circuits (1).
2. An ability to test the transformers. Be able to calculate voltage regulation, and efficiency (6).
3. An ability to test synchronous machines. Be able to calculate speed regulation, and efficiency (6).

4. An ability to test DC machines. Be able to calculate voltage regulation, speed regulation and efficiency (6).
5. An ability to use computer software to design electromagnetic devices based on experimental data (2).
6. An ability to write formal technical report and perform oral presentation to convey engineering message efficiently (3).

Laboratory Topics

1. Magnetic circuits and transformers: Transformer operations, connections, equivalent circuits, testing and practical use.
2. Alternating current machines-operation, testing and practical use.
3. Synchronous machines: Operation, excitation, equivalent circuits, testing and practical use.
4. Direct current machines: Operation, connections, equivalent circuits, control and applications.
5. Single-phase machines-special machines and applications
6. Three Phase power

Computer Usage

High

Laboratory Experience

High

Design Experience

High

Coordinator

Date

09/28/2018