

ELECTRICAL, COMPUTER, AND SYSTEMS ENGINEERING DEPARTMENT

**ABET COURSE SYLLABUS**

**EPOW \_4030: EPE Laboratory**

**Course Catalog Description:** A laboratory based examination of static and rotating energy conversion equipment. Topics include the experimental study of the physical phenomena and characteristics of magnetic circuits, transformers, electric machines, rectifiers, DC/DC converters and inverters. The interaction between static power converters and electric machines is emphasized. .

**Pre-Requisite Courses:** EPOW-4020 or EPOW-4080.

**Co-Requisite Courses:** .none

**Prerequisites by Topic:**

1. Phasors
2. 3 phase circuits
3. Faraday’s law/ Ampere’s law
4. Fourier analysis
5. Basic dc-dc converter topologies and operation
6. Rectifier/inverter topologies and basic operation

**Textbook:** Instructor Notes. Recommended Text: *Electric Machinery* by Fitzgerald, Kingsley and Umans  
(and/or other required material)

**References:** *Fundamentals of Power Electronics* by R. Erickson and D. Maksimovic.

**Course Coordinator:** Sheppard Salon

**Overall Educational Objective:** The objective of the class is to give the students and experience of designing experiments to verify some of the most fundamental principles of engineering. These include energy conversion and conservation, Maxwell’s equations and Newton’s laws of motion..

**Course Learning Outcomes:**

1. Gain a fundamental understanding of the basic laws of energy conversion and energy conservation.
2. Learn how to relate experimental results to theory
3. Operate as a team player in group environment
4. Understand safety issues related to rotating equipment and high voltage
5. Improve written communication

**How Course Outcomes are Assessed:** The only grade is the lab performance and laboratory reports..

**Relation to EE/CSE/EPE Outcomes**

**N = none**  
**M = moderate**  
**H = high**

Outcome	Level	Demonstrate Proficiency
	N, M, H	e.g. Exams, projects, HW
Mathematics, science and engineering	M	Laboratories
Basic disciplines in Electrical Engineering	N	
Depth in Electrical Engineering	H	Laboratories
Basic disciplines in Computer & Sys. Eng.	N	
Depth in Computer and Systems Eng.	N	
Electromagnetics, electromechanics, power semiconductors	H	Laboratories
Power system behavior	M	Laboratories
Electrical energy conversion	H	Laboratories
Conduct experiments and interpret data	H	Laboratories

Identify, formulate and solve problems	M	Laboratories
Design a system, component or process	N	
Communicate in written and oral form	M	Laboratories
Function as part of a multi-disciplinary team	N	
Preparation for life-long learning	M	Laboratories
Ethical issues; safety, health, public welfare	H	Laboratories
Humanities and social sciences	N	
Laboratory equipment and software tools	H	
Variety of instruction formats	M	Laboratories

**Topics Covered:  
(number of hours or classes for each)**

1. Laboratory fundamentals and Faradays Law (4 hours)
2. Single Phase Transformers (4 Hours)
3. Reluctance Machines (4 Hours)
4. DC Machines (4 Hours)
5. Single Phase Induction Machines (4 Hours)
6. 3 Phase Induction Machines (4 Hours)
7. Synchronous Machines (4Hours)
8. Rectifiers (4 Hours)
9. DC/DC Converters (4 Hours)
10. Inverters (4 Hours)
11. Transmission Lines, reactive power control (4 Hours).

**Computer Usage:**

The data acquisition is done entirely by computer. The students routinely use the computer for circuit simulation, MATLAB modeling, Fourier Analysis and report writing.

**Laboratory Experiences:**

1. Laboratory fundamentals and Faradays Law (4 hours)
2. Single Phase Transformers (4 Hours)
3. Reluctance Machines (4 Hours)
4. DC Machines (4 Hours)
5. Single Phase Induction Machines (4 Hours)
6. 3 Phase Induction Machines (4 Hours)
7. Synchronous Machines (4Hours)
8. Rectifiers (4 Hours)
9. DC/DC Converters (4 Hours)
10. Inverters (4 Hours)
11. Transmission Lines, reactive power control (4 Hours)..

**Design Experiences:**

1. The students have a 3 week project at the end of the class in which they select a topic, make a proposal and design and carry out the experiment.

**Independent Learning Experiences:**

1. Students are encouraged to research each topic and do a short literature search. There are often several references in each laboratory report.

**Class/Lab Schedule:**

Tuesday 8:00 – 9:00 AM lecture, Tuesday 9:00 – 12:00 Lab. Laboratory has extensive open shop hours.

**Contribution to the  
Professional Component:**

- (a) College-level mathematics and basic sciences: 0 credit hours  
 (b) Engineering Topics (Science and/or Design): 4 credit hours  
 (c) General Education: 0 credit hours

<b>Prepared by:</b>	Sheppard Salon
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