

ECE 305 Syllabus

Course: ECE 305
Credit Hours: 3
Course Title: Principles of Electromechanical Energy Conversion
Course Description:

Three-phase circuits and power flow, analysis of magnetic circuits, performance of single-phase and three-phase transformers, principles of electromechanical energy conversion, steady-state characteristics and performance of alternating current and direct current machinery.

Prerequisite(s): A grade of C- or better in ECE 211 and ECE 220

Textbook(s) and/or other required material:

Required class notes: Goetze, A. J., "Introduction to Electric Power Systems", NCSU Bookstore

Reference textbook : Fitzgerald, Kingsley, and Umans, " Electrical Machinery, 6th Ed."McGraw-Hill, 2002.

Course objectives. By the end of this course, the student should be able to (use demonstrative verbs):

1. Calculate/measure single-phase and three-phase real and reactive power flow.
2. Analyze and design simple magnetic devices relating mechanical dimensions to magnetic quantities.
3. Analyze the performance of practical single-phase and three-phase transformers.
4. Discuss electric- and magnetic-field interactions in electromechanical devices and machines.
5. Analyze the steady-state performance of practical synchronous, induction, and DC machines.

Topics covered:

- A. Real/reactive power flow and measurement, 3-phase systems analysis, power factor correction.(7)
- B. Properties of magnetic materials and magnetic circuit analysis.(6)
- C. Analysis of practical single-phase and three-phase transformers.(6)
- D. Principles of electromagnetic energy conversion.(12)
- E. DC machines and their performance.(4)F. Analysis of three-phase induction motors and synchronous motors/generators.(10)

Class/laboratory schedule (sessions per week and duration of each session):

Two 75-minute lectures per week

Contribution of course to meeting the requirements of Criterion 5 - other:

None

Contribution of course to meeting the requirements of Criterion 5 - math and basic sciences:

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1.0 hour

Contribution of course to meeting the requirements of Criterion 5 - engineering topics:

2.0 hours

Contribution of course to meeting the requirements of Criterion 5 - general education:

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome A	Major	Students learn how to combine electric and magnetic field theory with circuit theory, calculus, and elementary dynamics in a synergistic application to electrical transducers and energy converters common to control systems, instrumentation, and power systems.
Outcome B	Major	Students learn to visualize the interactions of electric and magnetic fields in commonly encountered electromechanical devices and machines and how forces/torques are developed in linear and rotational energy converters.
Outcome C	Intermediate	Students are asked to solve a wide range of homework problems, some of which require judgements and decisions relative to permissible levels of magnetic flux (saturation avoidance)

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome D	Basic	<p>and induced voltage(nonsinusoidal avoidance)in magnetic and electric converters. Students are encouraged to work in teams but each must be personally responsible for his/her own work and performance on assignments.</p>
Outcome E	Major	<p>Students must solve a comprehensive set of homework problems representative of those commonly encountered in situations of power engineering practice.</p>
Outcome F	Intermediate	<p>Students are made aware of the need for personal responsibility for professional and ethical behavior relative to homework assignments and performance in examinations. Each student is asked to certify in accordance with the honor code.</p>
Outcome G	Intermediate	<p>Students are expected to organize their homework solutions in an orderly, efficient, and explanatory manner.
Show-and-tell exhibits by students are encouraged.</p>
Outcome H	Basic	<p>In a non-dedicated way, some alternative energy sources (such as</p>

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
Outcome I	Basic	wind-power and fuel-cell generation) are briefly discussed. IEEE and ANSI standards are referred to in class and participation in professional societies is encouraged.
Outcome J	Basic	Application of some of the course coverage to electric transportation means is noted. Students are required to solve a comprehensive set of homework problems involving application of math, science, and engineering skills in a synergistic approach reflective of the industry-based context.
Outcome K	Major	

Person who last prepared this description and date of preparation:

- Grainger, John J. (jjag) - Apr 30th, 2009 (03:46pm)