ECE 452 Syllabus

Course: ECE 452

Credit Hours: 3

Course Title: Renewable Electric Energy Systems

Course Description:

This course focuses on the new renewable energy based electric energy generation technologies and their integration into the power grid. The principals of new energy based distributed generation technologies: solar, wind, and fuel cells. Interconnection of distributed generation sources to power distribution grid. Economic aspects of distributed generation.

Prerequisite(s): ECE305 or ECE331

Textbook(s) and/or other required material:

Renewable and Efficient Electric Power Systems - G. M. Masters
Edition: 2

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

1.Have a working knowledge of heat engines used for conventional power generation.
2.Calculate the basic performance parameters of a conventional generation system, such as efficiency and cost.
3.Have a working knowledge of the emerging power generation technologies such as photovoltaic arrays, wind turbines, and fuel cells.
4.Model renewable electrical energy systems for analysis and design.
5.Calculate the basic performance parameters of these systems, such as efficiency and cost.
6.Perform basic assessment and design of a renewable electrical energy system for a given application.
7.Determine the requirements for interconnecting a renewable electrical energy system to the utility electric power grid.

Topics covered:

Overview of Electric Power Systems (3)
PV - Solar resource (2)
PV - PV Cell physics (1)
PV systems (4)
Wind Power Systems (5)
Distribution Generators (6)
Economics of Dist Resources (5)

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

ECE 452 Syllabus

Two 75min. lectures per week.

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

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

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

Three hours of engineering topics.

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 to define and describe the pertinent principle, theory and concept of renewable energy based power conversion for wind, photovoltaic and fuel cell systems, as well as conventional heat engine based power generation systems. Students can demonstrate how these principles are used to model the generation systems and do basic performance calculations, such as efficiency and power output.
Outcome B	Intermediate	Students can perform basic analysis to estimate the energy output expected from a power generation system, given actual field data from the

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		renewable resources wind and sun.
Outcome C	Major	Given actual field data, students can determine basic design parameters for a wind turbine or a PV system. Students can choose the best alternative from a set of possible options and adopt a method to assess the feasibility of the design from economics point of view.
Outcome D	Basic	Students do a term projects where they are asked to collaborate with a graduate student.
Outcome E	Major	In addition to the course design project, students are required to solve a set of homework problems representative of the problems a practicing engineer working on renewable energy related projects needs to address.
Outcome F	Basic	Each student must organize and submit a complete, formal, written, report on the class design project, explaining the scope of his/her efforts.
Outcome G	Intermediate	Each student must organize and submit a complete, formal, written, report on the class design project,

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		explaining the scope of his/her efforts.
Outcome H	Intermediate	The sustainability both conventional fossil fuel based generation technologies and the new renewable energy based technologies are discussed, as well as the impact of these technologies on the environment. Also, the impact of power generation on the welfare of society is commonly discussed during the semester.
Outcome I	Intermediate	Students learn the importance of keeping up to date on the fast paste with which the renewable energy based technologies are progressing, and hence the need for life-long learning. Students also learn about professional societies (such as IEEE) in establishing, for example, national standards for power system equipment and its performance. ANSI standards for renewable energy based equipment are explained.
Outcome J	Intermediate	Students are made aware of some issues related to environmental impacts

Relationship of this course to program learning outcomes:

Learning Outcome	Level of Instruction	Related Course Content
		of fossil fuel based electric power. Also, linkages between electrical energy consumption and economic welfare of society are noted.
Outcome K	Major	Students are required to synergize their math, science, and engineering skills in solving descriptive problems of practical concern. Students learn how to use modern simulation tools such as Matlba/Simulink to perform simulations of especially the new renewable energy based power generation systems for assessment.

Person who last prepared this description and date of preparation:

- Baran, Mesut E (baran) - Apr 26th, 2010 (01:48pm)