EEO470: Renewable Distributed Generation and Storage

Spring 2014

2013-2014 Catalog Description:

This course introduces a specific type of electric power system, the microgrid. With ongoing deregulation of the electrical utility industry and emergence of more renewable smaller generation sources advancement into the electrical power industry will be met by microgrids. Topics will include a historical global perspective of electrical systems, individual enabling technologies that comprise a microgrid will be presented. The class involves a design of a microgrid that incorporates and considers economic, environmental, sustainable, manufacturable, ethical, health and safety, social and political constraints. (3 credits)

Course Designation: Technical Elective

Text Book: Renewable and Efficient Electric Power Systems by Gilbert M. Masters, John Wiley & Sons, 2004, ISBN: 0-471-28060-7
Power Systems Analysis and Design, 5th Edition by Glover, Sarma and Overbye, Thomson learning 2012. ISBN 978-1-111-42577-7
Sustainable Energy - Choosing Among Options, Tester, J. W., E. M. Drake, M. W. Golay, M. J. Driscoll, and W. A. Peters. Cambridge, MA: MIT Press, 2005. ISBN: 9780262201537.
Various Journal Articles as directed in class.

Prerequisites: EEO 271

Instructor: Jennifer Zirnheld, Ph.D.

Goals: The student will be able to propose and discuss ways engineers are contributing or might contribute to the solution of a specified regional, national, and global problem

Objectives: 1) The student will be able to examine a description of a problematic technology-related situation and identify ways that engineers might contribute to a solution. 2)The student will be able to model a prototype of a design and demonstrate that it meets performance specifications. 3)The student will be able to find relevant sources of information about a specified topic in the library and on the world wide web. 4)The student will be able to generate an oral presentation using electronic tools to disseminate their work.

Topics Covered:

Week 1.	Electric Power Industry – History and Overview

Week 2.	Distributed Generation I – Fossil Fuels, Solar, BioMass, Micro-Hydro
Week 3.	Distributed Generation II – Fuel cells, historical development, thermodynamics basics, theoretical efficiency
Week 4.	Project Introduction
Week 5.	Economics of Distributed Resources
Week 6.	Wind Power Systems I (Distributed Generation)
Week 7.	Wind Power Systems II (Distributed Generation)
Week 8.	Exam and Exam Review
Week 9.	Solar Resources (Distributed Generation)
Week 10.	PV Systems (Distributed Generation)
Week 11.	dc Distribution Systems
Week 12.	Peak power Shaving Systems
Week 13.	Interconnection Technologies
Week 14	Project Presentations

Class/laboratory Schedule: 3 lecture hours

Program Outcomes and Assessment	**% contribution**
✓ (a) an ability to apply knowledge of mathematics, science and engineering	10
❑ (b1) an ability to design and conduct experiments	
✓ (b2) an ability to analyze and interpret data	10
✓ (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	10
✓ (d) an ability to function on multi-disciplinary teams	10
✓ (e) an ability to identify, formulate, and solve engineering problems	10
✓ (f) an understanding of professional and ethical responsibility	10
✓ (g) an ability to communicate effectively	10
✓ (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	5
✓ (i) a recognition of the need for, and an ability to engage in life-long learning	10
✓ (j) a knowledge of contemporary issues	5
✓ (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	10
❑ Any other outcomes and assessments?	
❑ (l)) an ability to communicate and/or collaborate effectively online	

Document Prepared by: Jennifer Zirnheld, 3/17/14