

METROPOLITAN STATE COLLEGE of DENVER
Office of Academic Affairs

REGULAR COURSE SYLLABUS

School of: Professional Studies

Department: Engineering Technology

Prefix & Course Number: EET 3430 Crosslisted With*: _____

Course Title: Power Generation Using Renewable Energies

Check All That Apply: Required for Major: _____ Required for Minor: _____ Specified Elective: X
Required for Concentration: X Elective: X Service Course: _____

Credit Hours: 3 (3+0)

Total Contact Hours per semester (assuming 15-16 week semester):

Lecture 45 Lab 0 Internship _____ Practicum _____ Other (please specify type and hours): _____

Schedule Type(s): L Grading Mode(s): L

Variable Topics Courses (list restrictions, including the maximum number of hours that can be earned**):

**** NOTE: This information must be included in the course description.**

Restrictions (Variable Topics Course): _____

Prerequisite(s): (EET 2145 or EET 3010) and MTH 2410 with a grade of "C" or better

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Banner Enforced:

Prerequisite(s): (EET 2145 or EET 3010) and MTH 2410 with grades of "C" or better

Corequisite(s): _____

Prerequisite(s) or Corequisite(s): _____

Catalog Course Description:

This is an introductory course in electrical power generation that examines various types of renewable energy sources. While examining many developing technologies, the course concentrates on the design and application of photovoltaic and wind electrical generation. It examines conventional synchronous and induction machines, as well as modern doubly-fed induction machines and their application in wind generation. It also provides an introduction to inverter technology and methods of interfacing renewable energy power plants with the electrical power grid.

APPROVED:	<u>Rubad Pegg</u>	<u>3/1/2011</u>
	Department Chair OR Program Director	Date
	<u>B.R. Morganegg</u>	<u>3-1-11</u>
	Dean OR Associate Dean	Date
	<u>Shela Thompson</u>	<u>6/2/11</u>
	Associate VP, Academic Affairs	Date

*If crosslisted, attach completed Course Crosslisting Agreement Form

Required Reading and Other Materials will be equivalent to:

Patel, Mukund R. (2006). *Wind and Solar Power Systems Design, Analysis and Operation, 2nd Edition* or current edition. Boca Raton, FL: CRC Press

Specific, Measurable Student Behavioral Learning Objectives:

Upon completion of this course the student should be able to:

1. Analyze the problems, advantages and disadvantages inherent in the most common types of renewable energy-fueled power systems concentrating on photovoltaic and wind generation.
2. Solve engineering problems concerning the locating and design of wind and solar-fueled power plants.
3. Define the basic design requirements for wind, solar, and other types of renewable-fueled power plants.
4. Provide a basic description of the power electronics interface with the power grid.
5. Describe the operation of induction, synchronous, double-fed induction, and other common types of wind generators and their interface with the power grid.
6. Outline the basic requirements for interfacing solar-fueled power plants with the power grid.
7. Define the basic elements of fuel cells and the implications of the hydrogen economy.

Detailed Outline of Course Content (Major Topics and Subtopics) or Outline of Field Experience/Internship (experience, responsibilities and supervision):

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| <ul style="list-style-type: none"> I. Overview of Major Renewable Energy Types <ul style="list-style-type: none"> A. Wind B. Photovoltaic C. Solar Thermal D. Geothermal E. Fuel Cells F. Tidal and Wave II. Review of Electrical Mechanical Devices III. Wind Generation <ul style="list-style-type: none"> A. Industry Overview B. Wind Speed and Energy <ol style="list-style-type: none"> 1. Air Density 2. Rotor Swept Area and Power Input 3. Wind Speed Prediction C. Wind Power Systems <ol style="list-style-type: none"> 1. System Components 2. Turbine Spacing 3. Control Requirements 4. Environmental Aspects D. Offshore Wind Farms | <ul style="list-style-type: none"> IV. Photovoltaic <ul style="list-style-type: none"> A. PV Technologies B. Solar Energy Maps C. PV Cell D. I-V and P-V Curves E. Array Design <ol style="list-style-type: none"> 1. Sun Intensity 2. Sun Angle 3. Shadow Effect 4. Electrical Load Matching F. Energy Storage and Stand-Alone Systems <ol style="list-style-type: none"> 1. Battery Systems Design 2. Battery Safety And Management G. Grid Interconnected Systems V. Power Electronics And Inverters <ul style="list-style-type: none"> A. Grid Interconnected Inverters B. Stand-Alone Inverters VI. Geothermal Systems <ul style="list-style-type: none"> A. Geothermal Potential B. Turbine Energy Cycle C. Environmental Impacts |
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Evaluation of Student Performance:

1. Written Assignments
2. Exams
3. Projects or Papers