Renewable and Efficient Power and Energy Systems - ENGR 3510

ENGR 3510 – Renewable and Efficient Power Systems
Course Syllabus

Instructor Information
Dr. David Wenzhong Gao, Associate Professor of Electrical Engineering
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Class Meeting Time: T F 2:00 pm – 3:50 pm
Class meeting Location: ECS 400

Catalog Data: This course introduces the current and future sustainable electrical power systems. Fundamentals of renewable energy sources and storage systems are discussed. Interfaces of the new sources to the utility grid are covered.
Prerequisite: ENEE 2021 Circuits II.
4.000 Credit hours
4.000 Lecture hours
Levels: Graduate, Undergraduate

Textbook: Gilbert M. Masters, Renewable and Efficient Electric Power Systems 2nd Edition, Wiley--IEEE Press, 2013, ISBN 978-1-1181-4062-8. (e-book, check library).

Reference:

1. Leon Freris and David Infield, Renewable Energy in Power Systems, Wiley, ISBN 978-0-470-01749-4.
2. Wind Energy Explained, by James F. Manwell (Author), Jon G. McGowan, Anthony L. Rogers, Wiley; 2nd edition, ISBN-13: 978-0-47001-500-1.
3. Applied Photovoltaics, by Stuart R. Wenham (Editor), Martin A. Green (Editor), Muriel E. Watt (Editor), Richard Corkish (Editor), Publisher: Earthscan Publications Ltd.; 2nd edition (February 2007), ISBN-10: 1844074013, ISBN-13: 978-1844074013.
4. Felix A. Farret, M. Godoy Simoes, Integration of Alternative Sources of Energy, Wiley-IEEE Press, 2006, ISBN 0-471-71232-9.
5. Literature (papers/reports) on renewable energy and distributed generation / Handouts.

Electronic Textbook:

1. Wind: http://wind.ece.ksu.edu/
2. Solar: http://pveducation.org/; http://pvcdrom.pveducation.org/

Goals: To introduce fundamentals of renewable energy and distributed generation; understand the operating principles, benefits, technical and economical issues of distributed energy resources (DER). Analysis methods with probability and statistics for wind power will be studied.

Prerequisites:

1. ENEE 2021 Circuits II or equivalent
2. Graduate standing or instructor's consent.

Topical Outline: (Subject to adjustment)
Introduction, Electric Power Grid, Conventional Generation
fundamentals of electric systems (circuits and power)
The Solar Resource

Photovoltaic Materials, characteristics and PV Systems
Wind Power Systems (analysis with probability density function and cumulative distribution function)
Other Renewable Energy Sources
Smart Grid and Emerging Technologies
In-class exams
Case studies / projects

Course Policies

1. Office hours are as follows: M T W Th F 9:00 am – 10:00 am; 12:00pm – 1:00 pm
   For special needs, please make an appointment by sending emails.

2. Final grades will be based on the following:

Exam 1	**20%**	**200 points**
Exam 2	**20%**	**200 points**
Final comprehensive exam	**30%**	**300 points**
Homeworks	**10%**	**100 points**
Term Project	**20%**	**200 points**
Total	**100%**	**1000 points**

Letter Grades					
951-1000	**A**	**900-950**	**A-**		
868-900	**B+**	**834-867**	**B**	**800-833**	**B-**
768-800	**C+**	**734-767**	**C**	**700-733**	**C-**
668-700	**D+**	**634-667**	**D**	**600-633**	**D-**

Below 600 F

3. General Information:
   (1) All exams are closed book and closed notes. One formula sheet (8.5″x11″) double sided is allowed. A calculator is needed.
   (2) Concerns regarding the grade of any exam or assignment must be presented to the instructor within a week after the student receives the grade.
   (3) Term paper/project topics will be assigned for students to choose from. A final report and class presentation is required for the term paper/project.
4. If a student cannot take any exam at the designated time for legitimate reason, he or she must inform the instructor in advance so that appropriate measure can be taken for the student to take the exam. Term paper/project deliverables must be submitted on or before the due date.
5. Class attendance is encouraged. The student is responsible to get the class announcements and handouts.
6. **Announcements**: students are responsible to check their emails for any announcements on a daily basis.
7. Homework will be assigned on a regular basis. Solving homework will be helpful for exams. Computation by digital computer and use of computer simulation/plotting will be needed. Homework will not be returned. Please keep copies of your homework.
8. Discussion among students concerning assignments and course topics is encouraged. However, plagiarism and unethical behavior will not be tolerated. **Any use of a solutions manual (or solutions from other sources) by individuals or teams, will result in failure of the course and an academic dishonesty report.**

9. Technical tours (field trips) will be arranged when possiyhble. Students are strongly advised to participate in these tours.

University of Denver Honor Code

All students are expected to abide by the University of Denver Honor Code. These expectations include the application of academic integrity and honesty in your class participation and assignments. The Honor Code can be viewed in its entirety at this link: http://www.du.edu/ccs/honorcode.html.
Violations of these policies include, but are not limited to:
Academic Misconduct

- Plagiarism, including any representation of another's work or ideas as one's own in academic and educational submissions.
- Cheating, including any actual or attempted use of resources not authorized by the instructor(s) for academic submissions.
- Fabrication, including any falsification or creation of data, research or resources to support academic submissions.

Official Communications

The standard method of communicating official information from the School of Engineering and Computer Science to its students is through email. Students are provided a DU account using the protocol of firstname.lastname@du.edu, but must set up a "preferred" off-campus email address. Emails sent to the DU account will be forwarded to the preferred email account. DU accounts do not store messages. More information is available at: http://www.du.edu/studentemail/.

Students with Disabilities

A student who qualifies for academic accommodations because of a disability must submit a Faculty Letter to the instructor from the DU Disability Services Program (DSP) in a timely manner, so that the needs of the student can be addressed. Accommodations will not be provided retroactively, e.g., following an exam or after the due date of a project. DSP determines eligibility for accommodations based on documented disabilities. DSP is located in Ruffatto Hall, 1999 E. Evans Ave. (303-871-2455 / 2278 / 7432). On-line information is available at: http://www.du.edu/studentlife/disability/dsp/index.html , or you may check the *Handbook for Students with Disabilities*.

*Note: All information given in this document may be subject to change.