Cover Sheet: Request 11289

EEL4XXX Smart Grid for Sustainable Energy

Info

Process	Course|New|Ugrad/Pro
Status	Pending
Submitter	Chillingworth,Shannon M schill@ece.ufl.edu
Created	11/10/2016 2:29:24 PM
Updated	12/2/2016 9:51:30 AM
Description of request	Survey of power grid operations and markets for students with interest in power systems and/or sustainable energy. Characteristics of traditional and new energy resources; how resources impact the grid; control on many time-scales; how the power grid and power markets of tomorrow will differ from those of today.

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	ENG - Electrical and Computer Engineering 011905000	Fox, Robert M		11/14/2016
Added 4XXX Smart Grid - ucc1 syl.docx					11/10/2016
College	Approved	ENG - College of Engineering	Caple, Elizabeth		12/2/2016
No document changes					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			12/2/2016
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|New for request 11289

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Form version: 1

Responses

Recommended PrefixEEL
Course Level 4
Number XXX
Category of Instruction Advanced
Lab Code None
Course Title Smart Grid for Sustainable Energy
Transcript Title Smart Grid
Degree Type Baccalaureate

Delivery Method(s) On-Campus
Co-Listing Yes
Co-Listing Explanation This course is co-listed with the graduate class. The homework portion of the graduate section will involve additional work and more advanced concepts with respect to the undergraduate section. The exams will also involve more advanced concepts with respect to the undergraduate section.

Grading for the homework and projects are different from the graduate course. The homework has a higher grading percentage while the project has a lower grading percentage. The project for the undergraduates only requires a written report.
Effective Term Fall
Effective Year2017
Rotating Topic?No
Repeatable Credit?No

Amount of Credit3

S/U Only?No
Contact Type Regularly Scheduled
Weekly Contact Hours 003
Course Description Survey of power grid operations and markets for students with interest in power systems and/or sustainable energy. Characteristics of traditional and new energy resources; how resources impact the grid; control on many time-scales; how the power grid and power markets of tomorrow will differ from those of today.
Prerequisites EEL 4657C
Co-requisites None
Rationale and Placement in Curriculum This technical elective introduces the student to the area of traditional and new energy sources as well as emerging power markets.
Course Objectives The student will be able to explain the supply and demand of a power system; to design and analyze innovative policy, regulation, and business models in order to implement the next-generation grid architectures.
Course Textbook(s) and/or Other Assigned Reading No Required Textbooks.

Recommended Reading -

a. Title: Renewable and Efficient Electric Power Systems
b. Author: Gilbert M. Masters
c. Publication date and edition: 2004, Wiley
d. ISBN number: 978-1-118-14062-8

a. Title: Sustainable Energy-without the hot air
b. Author: David MacKay
c. Publication date and edition: available free online: http://www.withouthotair.com/

d. ISBN number: N/A

a. Title: Power Generation, Operation and Control
b. Author: Allen J. Wood, Bruce F. Wollenberg, Gerald B. Sheblé
c. Publication date and edition: 3rd edition, 2013, Wiley
d. ISBN number: 978-0471790556

Weekly Schedule of Topics Week Topics

1 Course overview. Role of generation beyond electric power. Dynamics and costs of traditional generators; characteristics of renewables. Why are power markets so volatile and hostile?
2 Convex optimization for resource allocation: Basic optimization theory will be developed throughout the course.
3 Economic dispatch and Lagrangian relaxations
4 AC and DC Power Flow
5 Dispatch, Markets, Competitive Equilibrium Theory
6 Locational Marginal Prices and the role of dynamics in markets
7 Basics of Unit Commitment, and Reserves. Demand response. Some basic probability is needed -- to be reviewed in lecture.
8 Reserves and Introduction to Grid Dynamics
9 Primary Control and Grid Modeling
10 Review of Classical Control and Introduction to Automatic Generation Control (AGC)
11 AGC and Secondary Control
12 Demand Response today and the role of policy. How to create grid services from flexible loads.
13 Energy Storage, Demand Dispatch: Buildings as batteries and automated demand response. The role of policy.
14-16 Selected student presentations

Links and Policies Grading Scale –

A	A-	B+	B	B-	C+	C	C-	D+	D	D- E
93-100	90-92	87-89	83-86	80-82	77-79	73-76	70-72	67-69	63-66	60-62 0-59

"A C- will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better)." Note: a C- average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement. For more information on grades and grading policies, please visit: https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

Make-Up Exam Policy - If you have a University-approved excuse and arrange for it in advance, or in case of documented emergency, a make-up exam will be allowed and arrangements can be made for making up missed work. University attendance policies can be found at:
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Otherwise, make-up exams will be considered only in extraordinary cases, and must be taken before the scheduled exam. The student must submit a written petition to the instructor two weeks prior to the scheduled exam and the instructor must approve the petition.

Honesty Policy – UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students at the University of Florida, the following pledge is either required or implied: "On my honor, I have neither given nor received unauthorized aid in doing this assignment." The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

Accommodation for Students with Disabilities – Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide documentation to the student who must then provide this documentation to the course instructor when requesting accommodation.

UF Counseling Services – Resources are available on-campus for students having personal problems or lacking clear career and academic goals. The resources include:
· UF Counseling & Wellness Center, psychological and psychiatric services, 3190 Radio Rd, 392-1575, online: http://www.counseling.ufl.edu/cwc/Default.aspx,
· Career Resource Center, Reitz Union, career and job search services, 392-1601.
· University Police Department, 392-1111 or 911 for emergencies

Software Use – All faculty, staff and student of the University are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against University policies and rules, disciplinary action will be taken as appropriate. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Course Evaluation – Students are expected to provide feedback on the quality of instruction in this course based on 10 criteria. These evaluations are conducted online at: https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at: https://evaluations.ufl.edu/results.

Grading Scheme 15. Grading –
20% - homework
70% - 2 exams
10% - written project report

Note: This course is co-listed with the graduate class. The homework portion of the graduate section will involve additional work and more advanced concepts with respect to the undergraduate section. The exams will also involve more advanced concepts with respect to the undergraduate section.

Grading for the homework and projects are different from the graduate course. The homework has a higher grading percentage while the project has a lower grading percentage. The project for the undergraduates only requires a written report.

Instructor(s) Dr. Sean Meyn

EEL 4XXX Smart Grid for Sustainable Energy

1. Catalog Description – (3 credits) Survey of power grid operations and markets for students with interest in power systems and/or sustainable energy. Characteristics of traditional and new energy resources; how resources impact the grid; control on many time-scales; how the power grid and power markets of tomorrow will differ from those of today.

2. Pre-requisites –EEL 4657C

3. Course Objectives – The student will be able to explain the supply and demand of a power system; to design and analyze innovative policy, regulation, and business models in order to implement the next-generation grid architectures.

4. Contribution of course to meeting the professional component – ABET 3 hours of Engineering Science

5. Relationship of course to program outcomes – ABET outcomes c, e

6. Instructor – Dr. Sean Meyn
    a. Office location: 455 NEB
    b. Telephone: 392-8934
    c. E-mail address: meyn@ece.ufl.edu
    d. Class Web site: https://lss.at.ufl.edu
    e. Office hours: Wednesdays, 4-5 p.m.

7. Teaching Assistant - NA

8. Meeting Times and Location – Tuesdays 7^{th}, Thursdays 7^{th}-8^{th} , 320 Benton

9. Class/laboratory schedule - 3 class periods each week consisting of 50 minutes each

10. Material and Supply Fees - None

11. Textbooks and Software Required - None

12. Recommended Reading -
    a. Title: Renewable and Efficient Electric Power Systems
    b. Author: Gilbert M. Masters
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13. Course Outline –

Week	Topics	Reading
1	Course overview. Role of generation beyond electric power. Dynamics and costs of traditional generators; characteristics of renewables. Why are power markets so volatile and hostile?	MacKay, WWS Ch. 1 & 2
2	Convex optimization for resource allocation: Basic optimization theory will be developed throughout the course.	WWS Ch. 3
3	Economic dispatch and Lagrangian relaxations	WWS Ch. 3
4	AC and DC Power Flow	Review and WWS
5	Dispatch, Markets, Competitive Equilibrium Theory	WWS Ch. 3 / Lecture notes
6	Locational Marginal Prices and the role of dynamics in markets	Lecture notes
7	Basics of Unit Commitment, and Reserves. Demand response. Some basic probability is needed -- to be reviewed in lecture.	WWS Section 4.1
8	Reserves and Introduction to Grid Dynamics	WWS Section 10.2
9	Primary Control and Grid Modeling	WWS Section 10.5
10	Review of Classical Control and Introduction to Automatic Generation Control (AGC)	Lecture notes
11	AGC and Secondary Control	WWS Section 10.5-10.7
12	Demand Response today and the role of policy. How to create grid services from flexible loads.	Lecture notes
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14-16	Selected student presentations	

14. Attendance and Expectations - Cell phones and other electronic devices are to be silenced. No text messaging during class or exams.

Experience with Matlab is essential.

All exams are closed-book. Calculators are allowed. One sheet of notebook paper (8.5"x11", both sides), is permitted in the first exam. For the second exam, two sheets of notebook paper (8.5"x11", both sides), are permitted in the exam.

In addition to regularly scheduled lectures, attendance is required at all ECE Power Systems lectures. Speakers are expected from New England ISO, academic visitors, as well as local industry. Information from these lectures may be included on exams.

The course project is based on a reading of a paper from the literature of your choice, subject to approval of the instructor. The following guidelines must be met:

(a) The report will be about four pages long, *not including any references, illustrations, or computer plots you might want to include*. It should be typed, and double spaced, and 11pt font.
(b) The report will consist of three parts: A summary of the paper considered, a critique, and a discussion of possible extensions of the results described in the paper.
(c) The *summary* must be concise — consisting of approximately one page. It should be clear enough to allow a fellow student to understand the main ideas of the paper.
(d) The *critique* should compare the results of the paper to what has been discussed in class, and should indicate the merits/shortcomings of the paper.
(e) *Numerical experiments* are not required, but might be valuable in your critique or the extensions

Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found in the online catalog at: https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

15. Grading –
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