

 <b>FLORIDA ATLANTIC UNIVERSITY</b>	<b>COURSE CHANGE REQUEST</b> <b>Graduate Programs</b>	UGPC Approval _____ UFS Approval _____ SCNS Submittal _____ Confirmed _____ Banner Posted _____ Catalog _____
	Department CEECS College College of Engineering and Computer Science	

<b>Current Course Prefix and Number</b> EEL 5291	<b>Current Course Title</b> Smart Grid
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Syllabus must be attached for ANY changes to current course details. See [Guidelines](#). Please consult and list departments that may be affected by the changes; attach documentation.

<b>Change title to:</b>  <b>Change prefix</b> From:                      To:  <b>Change course number</b> From:    5291              To:    6297  <b>Change credits*</b> From:                      To:  <b>Change grading</b> From:                      To:  <small>*Review <a href="#">Provost Memorandum</a></small>	<b>Change description to:</b>  <b>Change prerequisites/minimum grades to:</b>  <b>Change corequisites to:</b>  <b>Change registration controls to:</b>  Please list existing and new pre/corequisites, specify AND or OR and include minimum passing grade.
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<b>Effective Term/Year for Changes:</b> Spring 2020	<b>Terminate course? Effective Term/Year for Termination:</b>
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**Faculty Contact/Email/Phone**    Yufei Tang / tangy@fau.edu / 561-2974981

<b>Approved by</b> Department Chair _____ College Curriculum Chair _____ College Dean _____ UGPC Chair _____ UGC Chair _____ Graduate College Dean _____ UFS President _____ Provost _____	<b>Date</b> 5/12/19 5/14/19 5/15/2019 _____ _____ _____ _____
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Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) one week before the UGPC meeting.

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### **Rationale for Course Change Request**

The course "Smart Grid" has been taught as special topics "EEL 6935 Smart Grid" in Fall 2017 and Fall 2018, and it was added to the catalog recently (i.e. during the Fall 2018 semester) as "EEL 5291 Smart Grid". The 5000 – course level was selected by mistake during the new course proposal process, since this course was always taught at 6000 – level.

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**Department of Computer and Electrical Engineering and Computer Science  
Florida Atlantic University  
Course Syllabus**

<b>1. Course title/number, number of credit hours</b>	
Smart Grid EEL 6297	# of credit hours = 3
<b>2. Course prerequisites, corequisites, and where the course fits in the program of study</b>	
Prerequisites: Graduate Status Level OR Circuits (EEL 3111)	
<b>3. Course logistics</b>	
Term: TBA Class location and time: TBA	
<b>4. Instructor contact information</b>	
Instructor's name	Dr. Yufei Tang
Office address	EE 318 (Bldg. 96)
Office Hours	TBA
Contact telephone number	(561)297-4981
Email address	<a href="mailto:tangy@fau.edu">tangy@fau.edu</a> (best way to contact is by email)
<b>5. TA contact information</b>	
TBA	
<b>6. Course description</b>	
Exposes students to concepts, theories, methods, and latest topics in smart grids. Topics covered include principles and practices in data analytical, optimization, control, renewable energy, and electrical power systems.	
<b>7. Course objectives/student learning outcomes/program outcomes</b>	
Course objectives	The goal of this course is to provide students with a broad background in state-of-the-art computational methods that repeatedly arise in smart grid, such as machine learning, optimization, and control, and to provide hands-on experience applying these methods to real-world domains.
<b>8. Course evaluation method</b>	
(Tentative) Homework assignments (10% each × 4): 40% Term project proposal: 5% Term project millstone report: 10% Term project final report: 35% Attendance & responses: 10%	Homework problem sets will consist of 4-5 questions, usually requiring some mathematical derivation or a programming assignment. The final project for consists of an (up to) 5-page written report on an advanced research topic in computational methods for sustainable energy, smart grid, smart cities, and/or IoTs. Any students who are curious about potential research projects are encouraged to talk about possible topics during office hours. A short (300~500 words) project proposal will be due earlier in the semester, and a one-page project millstone report will be due in the middle of the semester (due dates to be announced in class).
<b>9. Course grading scale</b>	
Grading Scale: Score: 90%+    85%+    80%+    75%+    70%+    67%+    63%+    60%+    55%+    <55% Grade:    A        A-        B+        B        B-        C+        C        C-        D        F	
I typically adjust grades up from the above scheme, though grades will not be adjusted in the other direction. A 90.1% guarantees you an A no matter what.	
<b>10. Policy on makeup tests, late work, and incompletes</b>	
Makeup exams are given only if there is solid evidence of a medical or otherwise serious emergency that prevented the student of participating in the exam. Makeup exams will be administered and proctored by department personnel unless there are other pre-approved arrangements. Incomplete grades are against the policy of the department. Unless there is solid evidence of medical or otherwise serious emergency situation incomplete grades will not be given.	

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<b>11. Special course requirements</b>
N/A.
<b>12. Classroom etiquette policy</b>
University policy requires that in order to enhance and maintain a productive atmosphere for education, personal communication devices, such as cellular phones and laptops, are to be disabled in class sessions.
<b>13. Attendance Policy Statement</b>
Students are expected to attend all of their scheduled University classes and to satisfy all academic objectives as outlined by the instructor. The effect of absences upon grades is determined by the instructor, and the University reserves the right to deal at any time with individual cases of non-attendance. Students are responsible for arranging to make up work missed because of legitimate class absence, such as illness, family emergencies, military obligation, court-imposed legal obligations or participation in University-approved activities. Examples of University-approved reasons for absences include participating on an athletic or scholastic team, musical and theatrical performances and debate activities. It is the student's responsibility to give the instructor notice prior to any anticipated absences and within a reasonable amount of time after an unanticipated absence, ordinarily by the next scheduled class meeting. Instructors must allow each student who is absent for a University-approved reason the opportunity to make up work missed without any reduction in the student's final course grade as a direct result of such absence.
<b>14. Disability policy statement</b>
In compliance with the Americans with Disabilities Act Amendments Act (ADAAA), students who require reasonable accommodations due to a disability to properly execute coursework must register with Student Accessibility Services (SAS) and follow all SAS procedures. SAS has offices across three of FAU's campuses – Boca Raton, Davie and Jupiter – however disability services are available for students on all campuses. For more information, please visit the SAS website at <a href="http://www.fau.edu/sas/">www.fau.edu/sas/</a> .
<b>15. Counseling and Psychological Services (CAPS) Center</b>
Students who find stress negatively affecting their ability to achieve academic or personal goals may wish to consider utilizing FAU's Counseling and Psychological Services (CAPS) Center. CAPS provides FAU students a range of services – individual counseling, support meetings, and psychiatric services, to name a few – offered to help improve and maintain emotional well-being. For more information, go to <a href="http://www.fau.edu/counseling/">http://www.fau.edu/counseling/</a> .
<b>16. Honor code policy</b>
Students at Florida Atlantic University are expected to maintain the highest ethical standards. Academic dishonesty is considered a serious breach of these ethical standards, because it interferes with the university mission to provide a high-quality education in which no student enjoys unfair advantage over any other. Academic dishonesty is also destructive of the university community, which is grounded in a system of mutual trust and place high value on personal integrity and individual responsibility. Harsh penalties are associated with academic dishonesty. See University Regulation 4.001 at <a href="http://www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf">www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf</a> .
<b>17. Required texts/reading</b>
<ul style="list-style-type: none"><li>• Momoh, James A. Smart grid: fundamentals of design and analysis. John Wiley &amp; Sons, 2012.</li></ul>
<b>18. Supplementary/recommended readings</b>
The followings are recommended books for reading: <ul style="list-style-type: none"><li>• Cherkassky, Vladimir, and Filip Mulier. <i>Learning from data: Concepts, theory, and methods</i>. New York: Wiley, 1998.</li><li>• Boyd, Stephen, and Lieven Vandenberghe. <i>Convex optimization</i>. Cambridge University Press, 2004.</li></ul>

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Course Syllabus**

- Flick, Tony, and Justin Morehouse. *Securing the smart grid: next generation power grid security*. Elsevier, 2010.

**19. Course topical outline**

Weekly Schedule	Topics
Week 01	<ul style="list-style-type: none"> <li>– Overview of challenges in sustainable energy and smart grid</li> <li>– Illustrative examples of computation: wind energy and electrical power markets</li> <li>– Basic background on physics of energy</li> <li>– Overview of some ongoing research at FAU, such as the Southeast National Marine Renewable Energy Center</li> </ul>
Week 02	<ul style="list-style-type: none"> <li>– Linear algebra</li> <li>– MATLAB programming</li> <li>– HW-1 Posted</li> </ul>
Week 03	<ul style="list-style-type: none"> <li>– Examples of importance of prediction in energy systems</li> <li>– Application: electricity demand forecasting from weather data</li> <li>– Linear regression models and least squares</li> <li>– Optimization approaches to machine learning</li> </ul>
Week 04	<ul style="list-style-type: none"> <li>– Non-linear regression models with explicit feature and kernels</li> <li>– Alternative loss functions in regression</li> <li>– Application: identifying home appliances with non-intrusive load monitoring</li> <li>– Linear and non-linear classification models, logistic regression and support vector machines</li> <li>– Term project proposal due</li> <li>– HW-1 due</li> </ul>
Week 05	<ul style="list-style-type: none"> <li>– Evaluating machine learning algorithms</li> <li>– Time series prediction, autoregression models</li> <li>– Basics of DC circuits</li> <li>– HW-2 posted</li> </ul>
Week 06	<ul style="list-style-type: none"> <li>– AC circuits, real/reactive power</li> <li>– Generators, three-phase power, power electronics</li> <li>– HW-2 due</li> </ul>
Week 07	<ul style="list-style-type: none"> <li>– Power flow in AC networks</li> <li>– Newton’s method for solving non-linear power flow</li> <li>– HW-3 posted</li> </ul>
Week 08	<ul style="list-style-type: none"> <li>– Linearized DC power flow</li> <li>– Optimal power flow</li> </ul>
Week 09	<ul style="list-style-type: none"> <li>– Power markets and locational marginal pricing</li> </ul>

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	<ul style="list-style-type: none"> <li>- Control as optimization</li> <li>- HW-3 Due</li> </ul>
Week 10	<ul style="list-style-type: none"> <li>- Linear quadratic control</li> <li>- Application: control of energy storage system</li> <li>- Term project millstone report due</li> </ul>
Week 11	<ul style="list-style-type: none"> <li>- Model predictive control</li> <li>- Application: control using ML-based predictions and power systems constraints</li> <li>- HW-4 posted</li> </ul>
Week 12	<ul style="list-style-type: none"> <li>- Introduction to discrete control and combinatorial optimization</li> <li>- Special Lecture: Smart grid cyber-physical security</li> </ul>
Week 13	<ul style="list-style-type: none"> <li>- Special Lecture: Swarm intelligence - theory and method</li> <li>- Special Lecture: Swarm intelligence - smart grid applications</li> <li>- HW-4 due</li> </ul>
Week 14	<ul style="list-style-type: none"> <li>- Special Lecture: From smart grid to smart cities.</li> <li>- Reserved for guest lectures (1 lecture)</li> </ul>
Week 15	<ul style="list-style-type: none"> <li>- Future directions in smart grid research</li> <li>Term project presentation and final report due</li> </ul>