FLORIDA ATLANTIC UNIVERSITY

NEW COURSE PROPOSAL
Graduate Programs

UGPC Approval _____
UFS Approval _____
SCNS Submittal _____
Confirmed _____
Banner Posted _____
Catalog _____

Department CEECS

College College of Engineering and Computer Science
*(To obtain a course number, contact **erudolph@fau.edu**)*

Prefix EEL **Number** 5268	*(L = Lab Course; C = Combined Lecture/Lab; add if appropriate)* **Lab Code**	**Type of Course** Lecture	**Course Title** Smart Grid

Credits *(Review Provost Memorandum)*
3

Effective Date *(TERM & YEAR)*
Spring 2019

Grading *(Select One Option)*
Regular (●)
Sat/UnSat ( )

Course Description *(Syllabus must be attached; see Guidelines)*
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.

Prerequisites	**Corequisites**	**Registration Controls** *(Major, College, Level)*
Graduate Status Level OR Circuits (EEL 3111)	N/A	Graduates in College of Eng. & Comp. Sci., and Seniors

Prerequisites, Corequisites and Registration Controls are enforced for all sections of course

Minimum qualifications needed to teach course:	**List textbook information in syllabus or here**
Member of the FAU graduate faculty and has a terminal degree in the subject area (or a closely related field.)	Momoh, James A. Smart grid: fundamentals of design and analysis. John Wiley & Sons, 2012.
Faculty Contact/Email/Phone Dr. Yufei Tang, tangy@fau.edu, (561)297-4981	**List/Attach comments from departments affected by new course** N/A

Approved by	***Date***
Department Chair Margaret Ertol	9/20/18
College Curriculum Chair	9-24-2018
College Dean M Cardei	9/24/2018
UGPC Chair	
UGC Chair	
Graduate College Dean	
UFS President	
Provost	

Email this form and syllabus to UGPC@fau.edu one week before the UGPC meeting.

GRADUATE COLLEGE
SEP 25 2018
Received

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

1. Course title/number, number of credit hours	
Smart Grid EEL 5268	# of credit hours = 3
2. Course prerequisites, corequisites, and where the course fits in the program of study	
Prerequisites: Graduate Status Level OR Circuits (EEL 3111)	
3. Course logistics	
Term: TBA Class location and time: TBA	
4. Instructor contact information	
Instructor's name Office address Office Hours Contact telephone number Email address	Dr. Yufei Tang EE 318 (Bldg. 96) TBA (561)297-4981 tangy@fau.edu (best way to contact is by email)
5. TA contact information	
TBA	
6. Course description	
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.	
7. Course objectives/student learning outcomes/program outcomes	
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.
8. Course evaluation method	
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).
9. Course grading scale	
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.	
10. Policy on makeup tests, late work, and incompletes	
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.	

11. Special course requirements

N/A.

12. Classroom etiquette policy

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.

13. Attendance Policy Statement

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.

14. Disability policy statement

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 www.fau.edu/sas/.

15. Counseling and Psychological Services (CAPS) Center

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 http://www.fau.edu/counseling/.

16. Honor code policy

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 www.fau.edu/regulations/chapter4/4.001_Code_of_Academic_Integrity.pdf.

17. Required texts/reading

- Momoh, James A. Smart grid: fundamentals of design and analysis. John Wiley & Sons, 2012.

18. Supplementary/recommended readings

The followings are recommended books for reading:

- Cherkassky, Vladimir, and Filip Mulier. *Learning from data: Concepts, theory, and methods*. New York: Wiley, 1998.
- Boyd, Stephen, and Lieven Vandenberghe. *Convex optimization*. Cambridge University Press, 2004.

- 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	– Overview of challenges in sustainable energy and smart grid – Illustrative examples of computation: wind energy and electrical power markets – Basic background on physics of energy – Overview of some ongoing research at FAU, such as the Southeast National Marine Renewable Energy Center
Week 02	– Linear algebra – MATLAB programming – HW-1 Posted
Week 03	– Examples of importance of prediction in energy systems – Application: electricity demand forecasting from weather data – Linear regression models and least squares – Optimization approaches to machine learning
Week 04	– Non-linear regression models with explicit feature and kernels – Alternative loss functions in regression – Application: identifying home appliances with non-intrusive load monitoring – Linear and non-linear classification models, logistic regression and support vector machines – Term project proposal due – HW-1 due
Week 05	– Evaluating machine learning algorithms – Time series prediction, autoregression models – Basics of DC circuits – HW-2 posted
Week 06	– AC circuits, real/reactive power – Generators, three-phase power, power electronics – HW-2 due
Week 07	– Power flow in AC networks – Newton's method for solving non-linear power flow – HW-3 posted
Week 08	– Linearized DC power flow – Optimal power flow
Week 09	– Power markets and locational marginal pricing

	– Control as optimization – HW-3 Due
Week 10	– Linear quadratic control – Application: control of energy storage system – Term project millstone report due
Week 11	– Model predictive control – Application: control using ML-based predictions and power systems constraints – HW-4 posted
Week 12	– Introduction to discrete control and combinatorial optimization – Special Lecture: Smart grid cyber-physical security
Week 13	– Special Lecture: Swarm intelligence - theory and method – Special Lecture: Swarm intelligence - smart grid applications – HW-4 due
Week 14	– Special Lecture: From smart grid to smart cities. – Reserved for guest lectures (1 lecture)
Week 15	– Future directions in smart grid research Term project presentation and final report due