SACRAMENTO STATE

Course Change Proposal
Form A

Academic Group (*College*):	Academic Organization (*Department*):	Date:
Engineering and Computer Science	**Electrical & Electronic Engineering**	**April 20, 2009**
Type of Course Proposal: New _x_ Change ___ Deletion ___	**Department Chair:** **Suresh Vadhva**	**Submitted by:** **Turan Gonen**
Does this course fulfill a requirement for single-subject or multiple subject credential students? Yes ___ No _x_	**For Catalog Copy:** Yes _x_ No ___ **CCE (*Extension*):** Yes ___ No _x_	**Semester Effective:** Fall _x_ Spring ___, 2009

This course replaces experimental course Subject Area (*prefix*) and Catalog Nbr (*course number*):	
If changing an existing course, should new version be considered a repeat of the original version? If so, the same Course ID will be maintained. If not, a new Course ID will be assigned. Note: In PeopleSoft terminology, the Course ID is the unique system identifier, not the Catalog Nbr.	Yes ___ No ___

Change from:

Subject Area (*prefix*) & Catalog Nbr (*course no.*):	Title:	Units:

Change to:

Subject Area (*prefix*) & Catalog Nbr (*course no.*):	Title:	Units:
EEE 136	**Smart Electric Power Grid**	**3**

JUSTIFICATION:

This course will prepare students for advanced applications in power engineering, specifically the future electrical power grid. New topics, concerning the future, will be introduced, such as storage methods, digital and informational upgrades, and advanced metering infrastructure.

NEW COURSE DESCRIPTION: (Not to exceed 80 words, and language should conform to catalog copy. See http://www.csus.edu/umanual/acad.htm - Guidelines for Catalog Course Description

Smart grid to enhance reliability, security, robustness and efficiency of transmission and distribution systems. Integration of renewable energy sources and distributed generation. Energy storage systems. Advanced metering infrastructure, home-area networks, micro-grids, real-time pricing, plug-in hybrid vehicles, demand response, load curve shaping. Control, monitoring and protection of grid; SCADA systems. Voltage and load-frequency control to ensure energy balance. Enabling active participation of consumer. Anticipating and responding to system disturbance in self healing manner. Providing power quality for digital systems needs.

Note:

Prerequisite:
Enforced at Registration: Yes___ No___

Corequisite: EEE 142 or EEE 144
Enforced at Registration: Yes_x_ No___

Graded: Letter _x_ Credit/No Credit___	**Instructor Approval Required? Yes___ No_x_**
Course Classification (*e.g., lecture, lab, seminar, discussion*): **Lecture**	**Title for CMS (not more than 30 characters)** **Smart Electric Power Grid**
Cross Listed? Yes ___ No_x_	**If yes, do they meet together and fulfill the same requirement, and what is the other course.**

How Many Times Can This Course be Taken for Credit? _1_

Can the course be taken for Credit more than once during the same term? Yes ___ No _x_

FOR NEW COURSE PROPOSALS OR SUBSTANTIVE CHANGES ONLY:

Description of the Expected Learning Outcomes: Describe outcomes using the following format: "Students will be able to: 1), 2), etc." See the example at http://www.csus.edu/acaf/example.htm

Students will be able to:

1. **Understand the operation of the power system grid**
2. **Understand the new technologies to upgrade the performance of the grid**
3. **Confidently design the grid of the future**

**Attach a list of the required/recommended course readings and activities [Note: it is understood that these are updated and modified as needed by the instructor(s).] This attachment should be forwarded only to your Dean's office, not Academic Affairs.

Assessment Strategies: A description of the assessment strategies (e.g., portfolios, examinations, performances, pre-and post-tests, conferences with students, student papers) which will be used by the instructor to determine the extent to which students have achieved the learning outcomes noted above:

Homework assignments
Midterms
Final exam
Project reports
Literature research

For whom is this course being developed?
Majors in the Dept _x__ Majors of other Depts ___ Minors in the Dept ___ General Education ___ Other ___
Is this course required in a degree program (major, minor, graduate degree, certificate? Yes __ No ___
If yes, identify program(s):

Does the proposed change or addition cause a significant increase in the use of College or University resources (lab room, computer facilities, faculty, etc.)? Yes ___ No _x___
If yes, attach a description of resources needed and verify that resources are available.

Indicate which department or programs will be affected by the proposed course (if any). None

The Department Chair's signature below indicates that affected programs have been sent a copy of this proposal form.

Approvals: If proposed change, new course or deletion is approved, sign and date below. If not approved, forward without signing to the next reviewing authority, and attach an explanatory memorandum to the original copy.

Signatures:	**Date**
Department Chair: (For S.V.)	5/5/09
College Dean or Associate Dean:	5/5/09
CPSP *(for school personnel courses ONLY)*	
Associate Vice President and Dean for Academic Programs	

Distribution: Academic Affairs (original), Department Chair and College Dean. Dean's office to send original after approval to Academic Affairs, at mail zip 6016. An electronic copy must also be sent.

CONDITIONAL APPROVAL 5/11/09

9/10/2008

EEE 136 Smart Electric Power Grid

EEE Elective

2008-2010 Catalog Data: EEE 136. Smart Electric Power Grid. Smart grid to enhance reliability, security, robustness and efficiency of the transmission and distribution systems. Integration of renewable energy sources and distributed generation. Energy storage systems. Advanced metering infrastructure, home-area networks, micro-grids, real-time pricing, plug-in hybrid vehicles, demand response and load curve shaping. Control and protection of grid. SCADA monitoring and control system. Voltage and load-frequency control to ensure energy balance. Enabling active participation of consumer and digital and informational upgrade. Anticipating and responding to system disturbance in self healing manner. Providing power quality for digital systems needs. Corequisite: EEE 142 or EEE 144. 3 units.

Topics

1. Principles and overview of the smart electrical power grid. (3 weeks)
2) Review of the main features of power system transmission and distribution and their role in meeting the demand in electrical energy. Power flow in the grid. (2 weeks)
3) Methods of digital and informational upgrades to increase the quality and security of the power system. (1 week)
4) The role of advanced meters infrastructure, demand response, and smart communication with the consumer load to shape the power system load. (1 week)
5) Home area networks, plug-in hybrid vehicles, distributed generators, micro-grids, and distributed generation and their integration and protection in the power system. (1 week)
6) Introduction to renewable resources (wind, hydro, solar, geothermal, biomass and fuels, tidal). Emphasis will be on wind and solar sources. Environmental aspects (CO_2 reduction) (2 weeks)
7) Integration of these resources in the power grid. Problems in this integration regarding proper extraction of electrical energy and transmission. (1 week)
8) Energy storage from these intermittent resources (batteries, flywheels, etc.) (1 week)
9) Methods of reliability, security, and stability of the power system. Main principles of voltage control (reactive power balance) and load-frequency control (real power balance). Current methods of protection of the grid. (2 weeks)
10) Economic analysis. (1 week)

Evaluation

Homework, midterms, final. Projects and research of literature.

Texts and References

1) Power Engineering in smart Electrical Energy Networks by Ryszard Strzleck
2) Renewable Energy in Power Systems by Leon Freris and David Infield. Wiley 2008
3) Future Generation Grids by Vladimir Getove and Alexander Reinfield. Springer Verlay 207
4) Papers: IEEE Journals