WORKSHEET — Request for a New Course

** Place your pointer on the underlined fields and start typing to fill in text, **
or use an X or a number to fill in “check-box” or numbered fields.

Provide information requested below that is not contained in the syllabus.
Please note the guidelines in the boxes.

Number (if known): __EE 232V__    ___ Undergraduate___  __X__ Graduate ___ Professional

Title/subtitle: __Introduction to Smart Grid__

Effective: __Winter 2015__ (Quarter and Year)

Offered: ___ Fall ___ Winter __ Spring ___ Summer ___ Once Only ___ Other ___

Instructor(s): ____________________________

Hours per week per unit of credit may not be less than but may exceed those listed below.

• One unit for each hour per week (1:1) of colloquium, consultation, discussion, lecture, seminar, or workshop

• One unit for each three hours per week (1:3) of activity, clinic, extra reading, fieldwork, individual study, internship, laboratory, practicum, research (scheduled and outside), screening, term paper, thesis, tutorial, written work, and similar assigned problems

• One unit for each two to three hours per week (1:2-3) of studio

Units: __4__

Activities and hours per week: Indicate below the number of hours per week that students will spend in the activities listed (leave blank those that do not apply).

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>Internship</th>
<th>Seminar</th>
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<tr>
<td></td>
<td>Clinic</td>
<td>Laboratory</td>
<td>Studio</td>
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<td></td>
<td>Colloquium</td>
<td>Lecture</td>
<td>Term Paper</td>
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<td></td>
<td>Consultation</td>
<td>Practicum</td>
<td>Thesis</td>
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<td></td>
<td>Discussion</td>
<td>Research (outside)</td>
<td>Tutorial</td>
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<td></td>
<td>Extra Reading</td>
<td>Research (scheduled)</td>
<td>Workshop</td>
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<td></td>
<td>Field</td>
<td>Screening (outside)</td>
<td>Written Work</td>
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<tr>
<td></td>
<td>Individual Study</td>
<td>Screening (scheduled)</td>
<td>Other: ___</td>
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</tbody>
</table>

Prerequisite(s): __None__
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Read the guidelines in this box before writing the Catalog description.
Write the description in the present tense and limit it to 50 words (do not count grading information, repeatability information, or a list of E-Z subtitles). If possible, do not use complete sentences. However, use sentences that contain more than a list of items or topics.

Examples:
Instead of "This course will introduce students to the history of . . .," use one of the following formats:
- Introduces the history of . . .
- An introduction to the history of . . .
- Introduction to the history of . . .

Instead of "Functions, equations, and graphs," use a format similar to one of the following examples:
- Explores functions, equations, and graphs . . .
- Topics include functions, equations, and graphs . . .
- A study of functions, equations, and graphs . . .

Catalog description: _An introduction to smart power grid, covering basics of power systems, definition and applications of smart grid, demand response and demand side management, renewable power generation and integration, smart grid communications, wide area measurement, smart grid cyber security and privacy, and economics and market issues._

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**Grading**
- _Letter Grade or petition for Satisfactory/No Credit (S/NC)_.
- _Letter Grade only_.
- _In Progress (IP)_.
- _Letter Grade or S/NC; no petition required_.
- _S/NC only_.

The statements selected below will be added to the Catalog description by the Catalog office:

**Grading statement** (if required):
- Satisfactory (S) or No Credit (NC) grading is not available.
- Graded Satisfactory (S) or No Credit (NC).
- Normally graded Satisfactory (S) or No Credit (NC), but students may petition the instructor for a letter grade on the basis of assigned extra work or examination.
- May be taken Satisfactory (S) or No Credit (NC) with consent of instructor and graduate advisor.
- May be taken Satisfactory (S) or No Credit (NC) by students advanced to candidacy for the Ph.D.
- Students who submit a term paper receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
- Students who present a seminar receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
- Students who present a seminar or submit a term paper receive a letter grade; other students receive a Satisfactory (S) or No Credit (NC) grade.
- Other: ___

**Repeatability statement** (if required):
- Course is repeatable.
- Course is repeatable to a maximum of ___ units.
- Course is repeatable as content changes.
- Course is repeatable as content changes to a maximum of ___ units.
- Course is repeatable as topics change.
- Course is repeatable as topics change to a maximum of ___ units.
- Other: ___

If the course is repeatable, may a student take more than one section of the course in a single quarter? _Yes_ _No_

**Cross-listing statement:** Cross-listed with _NA_.

**Credit statement** (to limit credit when course content overlaps):
Credit is awarded for only one of ___

Other ___

**Breadth statement** (for CPAC, ETST, FVC, HASS, or WMST courses only):
- Fulfills the Humanities requirement for the College of Humanities, Arts, and Social Sciences.
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___ Fulfills the Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
___ Fulfills either the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
___ See the Student Affairs Office in the College of Humanities, Arts, and Social Sciences.
___ Does not fulfill the Humanities or Social Sciences requirement for the College of Humanities, Arts, and Social Sciences.
___ Other: ___

If the course **content overlaps or duplicates the content of another course**, describe the overlap or duplication: ___ NA ___

If the course **affects degrees, minors, and/or programs**, list the affected degrees, etc. and explain how they are affected:
___ This course is approved to be an "advanced course" for the Intelligent Systems track at the Department of Electrical Engineering. It is likely to soon become also an "advanced course" for Control Systems track. ___

If the course **affects the prerequisites and/or descriptions of other courses**, list the affected courses and explain how they are affected: ___ NA ___

**Justification** for establishing the course (insert or attach):

This course is needed because it will be used as part of the MSOL online degree program that the BCOE ECE department intends to offer. This V version of the course involves the following six components: a) a course management system, e.g., UCR's iLearn (BlackBoard) system, which UCR has been using for many years and with which most UCR faculty are already familiar; b) for online consultation with TAs and faculty, a web-based meeting system that includes shared desktop, audio, and possibly video communication. c) Remotely available online video recordings of classroom lectures (e.g., Flash 7.0+) with accompanying presentation graphics (e.g., PowerPoint slides). d) Remotely proctored exams, for which we will initially follow UCLA's policies and protocols; e) Lectures are online and would be a direct 1:1 "contact" as in a regular course. For the consultation, faculty members should be available for 1 hour/week to interact with the student via Skype (or other). f) In the evaluation, homework and other assignments are submitted via e-mail (or within iLearn). All exams are proctored. For remotely proctored exams, UCR intends to initially follow UCLA's policies and protocols.

**Syllabus** (insert or attach and include the information below): ___ Attached ___

**Course requirements** Mid-Term Exam, Final Exam, Homework, Term Paper

If an activity selected above under "Activities and Hours" does not involve faculty contact (e.g., extra reading, individual study, and outside research), describe the activity and explain how it will be evaluated.

If one of the activities selected above is **consultation hours**, explain how these hours will be implemented and monitored.

For further information about course guidelines, see the General Rules and Policies Governing Courses of Instruction at senate.ucr.edu/Committees/courses/guidelines.pdf
EE 232V: Introduction to Smart Grid

(Winter 2015)

Instructor:

Dr. Hamed Mohsenian-Rad
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Office: WCH 436
Email: Hamed@ece.ucr.edu

Course Purpose:

An introduction to smart power grid covering basics of power systems; definition and applications of smart grid; demand response and demand side management; renewable power generation and integration; smart grid communications; wide area measurement; smart grid cyber security and privacy; and economics and market issues.

Textbook:

The lecture handouts are used as the primary source of reading.

Course Topics:

1. Basics of Power Systems:
   - Load and Generation
   - Power Flow Analysis
   - Economic Dispatch and Unit Commitment Problems

2. Smart Grid:
   - Definition and Applications
   - Government and Industry
   - Smart Grid Two-way Communications Paradigm
   - Smart Meters and Advanced Metering Infrastructure

3. Demand Response:
   - Definition and Applications
   - Pricing and Energy Consumption Scheduling
   - Controllable Load Models, Dynamics, and Challenges
   - Electric Vehicles and Vehicle-to-Grid Systems

4. Renewable Generation:
   - Carbon Footprint
   - Renewable Resources: Wind and Solar
• Tackling Intermittency
• Stochastic Models and Forecasting

5. Energy Storage:
• Technologies
• Charging and Discharge Scheduling
• Microgrids

6. Security and Privacy:
• Privacy Challenges
• Cyber Security Challenges
• Load Altering Attacks
• False Data Injection Attacks
• Defense Mechanisms

7. Electricity Market:
• Energy and Reserve Markets
• Ancillary Services
• Locational Marginal Prices
• Market Power

Prerequisites:

Graduate Standing

Note: Background in Optimization is highly recommended.

Grading (Percentage):

Homework - 20%
Midterm Exam: 25%
Final Exam: 40%
Final Project Report and Presentation*: 15%

* Each student should select a topic related to smart grid based on the student's own interest and the approval from the instructor. Each student will give a 10 minutes presentation based on his/her project. A one page project report will also have to be submitted for the final project.