NEW COURSE PROPOSAL

College: [Engineering and Computer Science] **Department: [Electrical & Comp Engr]**

Note: Use this form to request a single course that can be offered independently of any other course, lab or activity.

1. **Course information for Catalog Entry**
   Subject Abbreviation and Number: **[ECE511]**
   Course Title: **[Distributed Energy Generation]**
   Units: **[3]** units
   Course Prerequisites: **[** ECE 350 or equivalent background in linear signals and systems **]** *(if any)*
   Course Corequisites: **[ ]** *(if any)*
   Recommended Preparatory Courses: **[ ]** *(if any)*

2. **Course Description for Printed Catalog:** *Notes:* If grading is NC/CR only, please state in course description. If a course numbered less than 500 is available for graduate credit, please state "Available for graduate credit in the catalog description."

   [Prerequisite: ECE 350 or equivalent background in linear signals and systems. This is a graduate level course on alternative energy resources for use in electric power systems. This course covers the operating principles of different distributed energy technologies such as combustion turbines, fuel cells, wind turbines, micro turbines, hybrid systems, photovoltaic systems and energy storage systems. Basics of smart grid, microgrid, distributed generators modeling, control, interconnection methods, principles of power electronic interfacing circuits, and application of each power generator will be presented and discussed. Students are encouraged to do a project on one topic related to today's distributed energy needs and challenges.**]**

3. **Date of Proposed Implementation: (Semester/Year): [Spring] / [2017]** *Comments*

4. **Course Level**
   []Undergraduate Only **[X]**Graduate Only **[]**Graduate/Undergraduate

5. **Course Abbreviation "Short title" (maximum of 17 characters and spaces)**
   Short Title: **[Dist Energy Gen]**

6. **Basis of Grading:**
   []Credit/No Credit Only **[x]Letter Grade Only** **[]CR/NC or Letter Grade**

7. **Number of times a course may be taken:**
   [X] May be taken for credit for a total of **[1]** times, or for a maximum of **[3]** units
   [ ] Multiple enrollments are allowed within a semester

8. **C-Classification:** *(e.g., Lecture-discussion (C-4).)*
   [3] units @ **[C] [4]**

9. **Replaces Current Experimental Course?**
   [x] YES **[ ]** NO

Replaces Course Number/Suffix:**[ECE595DEG]**
Previously offered **[3]** times.

10. Proposed Course Uses: *(Check all that apply)*

[X]Own Program: **[X]**Major **[ ]**Minor **[X]**Masters **[ ]**Credential **[ ]**Other
[ ] Requirement or Elective in another Program
[ ] General Elective
[ ] General Education, Section **[ ]**
[ ] Meets GE Information Competence (IC) Requirement
[ ] Meets GE Writing Intensive (WI) Requirement
[ ] Community Service Learning (CS)
[ ] Cross-listed with: *(List courses)* **[ ]**

11. Justification for Request: *Course use in program, level, use in General Education, Credential, or other. Include information on overlap/duplication of courses within and outside of department or program. (Attach)*

Alternative energy development is a great help to free the world from oil dependence. As a result, energy generation from alternative resources is increasing rapidly. A recent study from Department of Energy indicates that wind capacity installations grew rapidly and solar photovoltaic installation grew from 31 MW in 2008 to 10000 MW in 2015. Due to the substantial growth in sustainable energy technologies, there is a need for a new course with a focus on power systems. In this course:

(1) The future structure of a power system involving distributed generators using unconventional energy resources is introduced.
(2) Operating principles of different distributed energy technologies such as micro/combustion turbines, fuel cells, wind turbines, hybrid systems, photovoltaic systems, concentrated solar systems, small hydro generators, ocean energy, and energy storage systems are covered.
(3) The basics of modeling, control, interconnection methods, power electronic interfacing circuits, and industrial applications are presented.

12. Estimate of Impact on Resources within the Department, for other Departments and the University. *(Attach)*

MATLAB/Simulink/Simpowersys toolbox is needed for this course which is available for students in all ECE computer labs. The number of licenses for Simpowersys toolbox needs to be doubled.

(See Resource List)

13. Course Outline and Syllabus *(Attach) Include methods of evaluation, suggested texts, and selected bibliography.* Describe the difference in expectations of graduates and undergraduates for all 400 level courses that are offered to both. (attached)

14. Indicate which of the PROGRAM'S measurable Student Learning Outcomes are addressed in this course. *(Attach)*

Graduate Student Outcomes Covered by this Course:

b. Apply knowledge of advanced techniques to the design of electrical and computer engineering systems.
c. Apply the appropriate industry practices, emerging technologies, state-of-the-art design techniques, software tools and research methods for solving electrical and computer engineering problems.
d. Use the appropriate state-of-the-art engineering references and resources, including IEEE research journals and industry publications, to find the best solutions to electrical and computer engineering problems.
e. Communicate clearly and use the appropriate medium, including written, oral and electronic methods.
f. Maintain lifelong learning and continue to be motivated to learn new subjects.
h. Be competitive in the engineering job market and/or be admitted to an excellent Ph.D. program.

15. Assessment of COURSE objectives *(Attach)*

A. Identify each of the course objectives and describe how the student performance will be assessed

See attachment.

(For numbers 14 and 15, see Course Alignment Matrix and the Course Objectives Chart)

16. If this is a General Education course, indicate how the General Education Measurable Student Learning Outcomes (from the appropriate section) are addressed in this course. *(Attach)*

17. Methods of Assessment for Measurable Student Learning Outcomes *(Attach)*

A. Assessment tools
B. Describe the procedure Dept/program will use to ensure the faculty teaching the course will be involved in the assessment process (refer to the university's policy on assessment.)

18. Record of Consultation: *(Normally all consultation should be with a department chair or program coordinator.) If more space is needed attach statement and supporting memoranda.*

Date:	Dept/College:	Department Chair/ Program Coordinator	Concur (Y/N)
[9/18/2015]	[ECE/CECS]	[Dr. George Law]	[Y]
[10/2/2015]	[ME/CECS]	[Dr. Hamid Johari]	[Y]
[10/2/2015]	[CECM/CECS]	[Dr. Nazaret Dermendjian]	[Y]
[10/2/2015]	[MSEM/CECS]	[Dr. Ahmad Sarfaraz]	[Y]
[10/2/2015]	[CS/CECS]	[Dr. Rick Covington]	[Y]

[ ] **[ ]** **[ ]** **[ ]**

Consultation with the Oviatt Library is needed to ensure the availability of appropriate resources to support proposed course curriculum.

Collection Development Coordinator **Date**

Please send an email to: collection.development@csun.edu **[ ]**

19. Approvals:

Department Chair/Program Coordinator:	George Law	Date:	**[9/18/2015]**
College (Dean or Associate Dean):	Robert Ryan	Date:	**[ ]**
Educational Policies Committee:		Date:	**[ ]**
Graduate Studies Committee:		Date:	**[ ]**
Provost:		Date:	**[ ]**

California State University, Northridge

College of Engineering & Computer Science

Department of Electrical & Computer Engineering

ECE 595DEG - Distributed Energy Generation

"In two decades, when the Distributed Energy Program's vision and mission are fulfilled, industrial, commercial, institutional, and residential customers will be able to choose from an array of ultrahigh-efficiency, ultralow-emission, fuel-flexible, and cost-competitive distributed energy (DE) products and services. These DE products and services will use natural gas and renewable energy and will be easily interconnected with the nation's infrastructure for the next generation of electricity" [1]

Course Units: 3.00

Professor: Dr. Kourosh Sedghisigarchi
Office: JD 3345
Office Hours:
Office Phone: 818-677-2036
ECE Fax: 818-677-7062
EMAIL: ksedghi@csun.edu

I. Course Description and Objective:

Course Description: This is a graduate level course on alternative energy resources for use in electric power systems. This course covers the operating principles of different distributed energy technologies such as combustion turbines, fuel cells, wind turbines, micro turbines, hybrid systems, photovoltaic systems and energy storage systems. Basics of smart grid, microgrid, distributed generators modeling, control, interconnection methods, principles of power electronic interfacing circuits, and application of each power generator will be presented and discussed. Students are encouraged to do a project on one topic related to todays distributed energy needs and challenges. Students are expected to know the basics of power systems.

Course Objectives:

1. Obtain knowledge of different distributed power generation technologies such as fuel cells, wind turbines, combustion turbines, photovoltaic systems, and energy storage devices

[1] http://www.eere.energy.gov/de/mission_vision_strat.html

2. Learn the principles, difficulties, and challenges of the future integrated power system structure particularly in distribution level
3. Model, control and analyze the distributed energy resources
4. Learn basics of interfacing techniques of distributed energy resources
5. Get familiar with the recent achievements in distributed energy area
6. Apply software tools, particularly SimpowerSystems Toolbox, to the assigned project and the analysis and design of related work
7. Develop more written and oral communication as well as teamwork skills
8. Research and survey on the new topics in energy area

II. Pre-requisites:

ECE 350 or equivalent background in linear signals and systems

III. Textbook:

There will not be a specific textbook for this course. Students will be given related materials such as recent publications, technical reports, and book chapters and so on.

- **Suggested References**:

- "Integration of Distributed Generation in the Power System" (IEEE Press Series on Power Engineering By Math H. Bollen, Fainan Hassan, 524 pages, Wiley-IEEE Press; 1 edition (August 9, 2011, ISBN_10: 0470643374, ISBN-13: 978-0470643372

- "Integration of Alternative Sources of Energy" by Felix A. Farret (Author), M. Godoy Simões (Author) Hardcover: 504 pages, Publisher: Wiley-IEEE Press (January 17, 2006), ISBN-10: 0471712329, ISBN-13: 978-0471712329

- "Renewable and Efficient Electric Power Systems", by Gilbert M. Masters (Author) Hardcover: 680 pages, Publisher: Wiley-IEEE Press (August 11, 2004), ISBN-10: 0471280607, ISBN-13: 978-0471280

- IEEE Transactions and peer reviewed conference publications (recommended by the instructor)

Simulation Packages:

Students will use MATLAB based Simpowersystem Blockset, or MATLAB/SIMULINK for their projects. Other available power system packages such PSCAD or EMTP can be used depending on the project topic.

IV. Relationship to Students Outcomes

Graduate Student Outcomes:

b. Apply knowledge of advanced techniques to the design of electrical and computer engineering systems.

c. Apply the appropriate industry practices, emerging technologies, state-of-the-art design techniques, software tools and research methods for solving electrical and computer engineering problems.
d. Use the appropriate state-of-the-art engineering references and resources, including IEEE research journals and industry publications, to find the best solutions to electrical and computer engineering problems.
e. Communicate clearly and use the appropriate medium, including written, oral and electronic methods.
f. Maintain lifelong learning and continue to be motivated to learn new subjects.
h. Be competitive in the engineering job market and/or be admitted to an excellent Ph.D. program.

V. Grading Policy:

Each student chooses one area to do research subject to instructor's approval. Students must choose their topic in the first six weeks of the semester and specify and present their project tasks by mid-semester. During the second half of the semester, students need to report to the instructor about the status of the predefined project on a bi-weekly basis. A final written report will be submitted to the instructor and results of the related work will be presented to the entire class. Each student is expected to present at least one recent highly ranked journal publication in the class.

Software Simulation/Homework/Reports	35%
Midterm (Presentation)	20%
Presentations	25%
Final project report	20%
Attendance/Performance	5%

100% + 5% Bonus

GRADE Scales:

A	90-100%
B	80-90%
C	70-80%
D	60-70%
F	Below 60%

Plus/minus grading may be used, at the discretion of the professor. Grades will be based on the total percentage of points accumulated.

VI. Homeworks:

It will be collected a week after it has been assigned, NO LATE HOMEWORK SUBMISSION WILL BE ACCEPTED.

Homework must be typed (unless mentioned by the instructor) and must include a cover page with the following information:

Name, ECE595DEG, Date, Homework # and Problem Title.

Homeworks must be stapled, organized and clean and easy to follow.

No Black background for your plots is allowed.

VII. Class Rules:

- All cell phones must be turned off or be in the silent mode
- Only the homework due will be collected
- Plagiarism is not allowed!!! And may result in a grade of F for the course.
- Classes will start and end on time, Please plan ahead.
- Please include your picture in the Moodle so I can recognize you if necessary.

VIII. Class Policies and Procedures

Attendance:

Each student is required to attend every lecture. Students are responsible for arriving before class begins, and remaining for the duration of the course meeting. If a student misses a class, it is his or her responsibility to find out what was discussed in class, any homework assigned or exam scheduled.

Make-Up Exam And Homework:

No late homework/report/presentation will be accepted.

General Rule:

If you have any questions or concerns about any of the grading, please see the instructor by the next class period. Otherwise, after the subsequent class period the grade becomes final.

Academic Integrity:

California State University Northridge 2010-2012 Catalog: Appendix E-2. Academic Dishonesty, pp. 614-616

The maintenance of academic integrity and quality of education is the responsibility of each student within this university and the California system. Cheating or plagiarism in connection with an academic program at campus is listed in section 41301, Title V, California code of Regulations, as an offense for which a student may be expelled, suspended, or given a less severe disciplinary sanction. Academic dishonesty is an especially serious offense and diminished the quality of scholarship and defrauds those who depend upon the integrity of campus programs.

IX. Course Topics

Week	Lecture Topics
1	Introduction to power systems
2	Power system background/ MATLAB Simulink, Simpowersystem toolbox)
3	Future Structure of power generation
4	Distributed Generation
5	Microturbine, Wind power generation
6	Fuel cells as power generators
7	Solar photovoltaic power systems
8	Energy storage devices
9	Interfacing techniques
10	Microgrid: challenges, difficulties, drawbacks
11	Principles of Distributed Generation (DG) control
12	Distributed Generation Economics
13	System design samples
14	Student paper/project presentation
15	Student paper/project presentation
Final Exam week	

COURSE ALIGNMENT MATRIX

Directions: Assess the how well ECE511 contributes to the program's student learning outcomes by rating each course objective for that course with an I, P or D.

I = Introduced (basic level of proficiency is expected)

P = Practiced (proficient/intermediate level of proficiency is expected)

D = Demonstrated (highest level/most advanced level of proficiency is expected)

Course Objectives	b. Apply knowledge of advanced techniques to the design of electrical and computer engineering systems.	c. Apply the appropriate industry practices, emerging technologies, state-of-the-art design techniques, software tools and research methods for solving electrical and computer engineering problems.	d. Use the appropriate state-of-the-art engineering references and resources, including IEEE research	e. Communicate clearly and use the appropriate medium, including written, oral and electronic methods.	f. Maintain lifelong learning and continue to be motivated to learn new subjects.	h. Be competitive in the engineering job market and/or be admitted to an excellent Ph.D. program.
1. Obtain knowledge of different distributed power generation technologies such as fuel cells, wind turbines, combustion turbines, photovoltaic systems,		**P**	**I**			

and energy storage devices						
2. Learn the principles, difficulties, and challenges of the future integrated power system structure particularly in distribution level	**I**	**P**	**I**			
3. Model, control and analyze the distributed energy resources		**D**	**P**			
4. Learn basics of interfacing techniques of distributed energy resources	**P**	**P**	**P**			
5. Get familiar with the recent achievements in distributed energy area			**P**		**P**	
6. Apply software tools, particularly SimpowerSystems Toolbox, to the assigned project and the analysis and design of related work		**P**				
7. Develop more written and oral communication as well as teamwork skills				**P**	**P**	
8. Research and survey on the new topics in energy area			**P**			**I**