

**Graduate Certificate in
Renewable Energy Engineering and Policy
REEP-CERT**

I. Description

Objective: To serve as a recruiting tool for graduate engineering programs with an emphasis on renewable energy engineering and policy, and to recognize the graduate student's interest and academic accomplishments in the field of renewable energy.

II. Rationale and Demand

A. Institutional Factors

1. UD Mission Compatibility – Among the “milestones” mapped out in UD’s *Path to Prominence* were excellence in professional education. Engineering professionals speak highly of UD’s graduate engineering courses and are spreading the word among their colleagues.
2. Planning Process – This certificate program concept was initially discussed as part of an NSF IGERT Program (which has now ended). Courses in various forms of alternative energy currently exist, so that this certificate planning involved discussing which courses should be considered “core” while allowing some element of “specialization” through taking an elective in alternative energy.
3. Impact on other UD Programs – Program course requirements are all existing graduate courses in the College of Engineering. Hence the only “impact” would be to maximize enrollment in the courses that are part of the certificate. Some of those courses are already provided in distance format, and there is discussion around making others available in distance or blended formats. But the resources to do so are already in existence on campus.
4. Utilization of Existing Resources – No additional resources are required at this point, as all courses are existing.

B. Student Demand – Degree program students in energy and environmental policy, as well as environmental, electrical, mechanical and materials science/engineering already utilize alternative energy courses as electives, sometimes for personal interest, other times in support of their research in energy engineering and energy policy. Engineering professionals who contact the Engineering Outreach Program indicate an interest in being able to take energy engineering courses and/or earn a graduate certificate. (Employers are sometimes only willing to pay tuition benefits if the student is enrolled in a degree or certificate program.)

C. Transferability – The certificate program courses are all transferable into a graduate program in energy and environmental policy, civil/environmental engineering, electrical engineering, materials science & engineering, or mechanical engineering. Because the University policy is that at most 9 credits taken in non-degree status can be transferred into a graduate degree program, completion of this graduate certificate is in conformity with that policy, should the student decide to apply/is accepted into a graduate degree program.

D. Graduate and Professional Program Access – Those wishing to pursue this graduate certificate will be guided by Engineering Outreach staff through the admissions process used for all engineering graduate/non-degree students, including review of undergraduate transcripts and completion of the UD graduate application to Engineering Outreach/Non-degree status. Prior to completion of the third course, the student will be counseled appropriately if there is interest in continuing toward a graduate degree program.

E. Demand & Employment Factors – Earning this certificate in renewable energy will recognize expertise/academic accomplishments, enhancing employability in alternative energy industries.

For example, Engineering Outreach periodically receives inquiries regarding the possibility of earning a certificate in wind power engineering. As the world continues to move away from dependence on fossil fuels, more jobs are being created in alternative energy areas. Employment in the solar energy industry alone has grown significantly over the past decade.

Comments from the Bureau of Labor Statistics (BLS)

(http://www.bls.gov/green/solar_power/#growth), include the following: “Because of a growing interest in renewable energy and the increasingly competitive prices of alternative energy sources, solar power has received a lot of attention over the past several years. ... Continued growth is expected because solar power has many environmental benefits and is decreasing in price, which will allow it to become increasingly competitive with fossil fuels.” Similarly for other renewable energy options such as wind, geothermal, biofuels, and others yet to be discovered!

- F. Regional, State and National Factors - A 2008 Occupational Outlook Quarterly Report of the BLS (<http://www.bls.gov/ooq/2008/fall/art02.pdf>) stated that “Electricity generated from renewable sources is one of the fastest growing segments of the electric power industry.”

In order to be economically viable, continued research will be needed to bring down costs, and as the various industry areas (solar, wind, hydro, geothermal, nuclear, etc.) expand, the workforce in those areas will expand at many employment levels.

- G. Other Strengths –

- By requiring three graduate level courses in energy engineering, the graduate certificate will recognize not only a foundation in renewable energy (based on the two required core courses), but also some depth of knowledge in a particular renewable energy area, based on an elective course.
- Because it will be possible to earn the certificate through graduate engineering courses that are rotated in/out of late-day times and/or provided in distance format, it will be feasible to earn the certificate while working full-time.
- Because these are the same graduate courses taken by full-time graduate students, full-time students will learn from, and make contacts with, industry participants in the classes. Meanwhile, industry participants will gain from being in class with those engaged in leading-edge energy research.

III. Enrollments, Admissions and Student Finances

- Students matriculated in any STEM graduate program at the University of Delaware are eligible to pursue the REEP-CERT. The STEM graduate student’s record will be reviewed by the certificate co-directors to ensure satisfactory completion of courses that will be prerequisite to success in the core courses and targeted electives in the certificate program.
- Non-matriculated students will apply for graduate/non-degree status (EGOR-ND) following the admission policy of the Engineering Outreach Program. This requires the student to submit an unofficial copy of his/her undergraduate transcript, along with a statement of specific interests and targeted elective courses within the REEP/CERT. The Assistant Dean/Director of Engineering Outreach will review the transcript, which must indicate completion of an undergraduate degree in one of the STEM fields, and satisfactory completion of courses that provide the prerequisite knowledge needed for success in the targeted REEP-CERT courses. If approved, the Assistant Dean/Director of Engineering Outreach will then guide the student through the admission process for EGOR-ND matriculation status and thereafter will advise and register the student for the three chosen REEP-CERT courses.
- The participation at any given point is expected to be approximately 20 students, limited only by the availability of “seats” in the core courses (which can be extended through distance

- formatting of the courses).
- Part-time students are self- or industry-funded.

IV. Curriculum Specifics

Note that any of the courses currently listed, or later added to the list of core course options, that are not used to fulfill the required core may be used as an elective course.

The REEP-CERT requires satisfactory completion of three (3) graduate level courses (9 credits) as detailed below. Each certificate program course must be completed with a grade no lower than C; the overall gpa of the REEP-CERT courses must be no lower than 3.0.

Required Core Courses:

Two 3-credit courses, selected from the following:

ELEG637, Energy Systems

ENEP625, Energy Policy and Administration

Elective Course Options (each 3-credit courses):

One course from the following list. (Also see the note above.)

CHEG614, Special Topics in Energy (needs clearance by semester, as topics vary)

ELEG615, Electric Power & Renewable Energy Systems

ELEG620, Solar Energy Systems

ELEG628, Solar Energy Technology and Applications

ELEG637, Energy Systems

ENEP660, Engineering Economic Analysis for Sustainable Energy

MAST622/UAPP626, Conservation and Renewable Energy Policy

MAST628, Offshore Wind Power: Science, Engineering and Policy

MEEG635, Wind Power Engineering

MEEG642, Introduction to Fuel Cells

MSEG650, Topics in Renewable Energy

MSEG670, Solar Energy

As research in the REEP fields progresses and new courses are developed (and approved through the Course Challenge process) that are relevant to the REEP-CERT, the graduate committee of the home department of the respective proposed elective may add the new course to the list of elective options in the REEP-CERT.

Examples currently being offered as “experimental courses” that could be approved for the REEP-CERT include:

CHEG667 – Environment and Energy

ELEG667 – The Smart Grid

ELEG/MAST667 – Electric Vehicles and the Grid

MAST/GEOG667 – Wind Power Meteorology

V. Resources Available

There are no special learning resources required to support this certificate program, other than the availability of UDCapture and a learning management platform, both of which currently exist.

VI. Resources Required

Current resources (learning resources as well as faculty resources) are currently sufficient to support this graduate certificate program.

VII. Implementation and Evaluation

In collaboration with the Engineering Outreach Program, this graduate certificate will be marketed broadly. Because of the anticipated part-time status of many of its clientele, the program will be administered by the Engineering Outreach Program, including admission and advisement (in collaboration with the graduate program managers in the respective course departments).

Upon completion of three certificate program courses with grades of B or better (or Satisfactory, in the case of those taking the courses pass/fail), Engineering Outreach will notify the Graduate Office to have the notation added to the graduate transcript, "Completion of the Renewable Energy Engineering and Policy Certificate."

University course evaluations of the certificate program courses (which are part of the graduate curricula in the College of Engineering) will be reviewed by the respective departments. In addition, a follow-up survey will be conducted by the Engineering Outreach Program of those who complete the certificate program in an effort to assess the usefulness of the information provided for those in the industry. That feedback will be provided to the respective course faculty and to the departmental graduate committees in the College of Engineering, enabling continual improvement.