

Graduate Certificate in Wind Power Science Engineering and Policy

crew.udel.edu/graduate-certificate-program/

The Graduate Certificate in Wind Power Science Engineering and Policy is an interdisciplinary program administered by the College of Earth, Ocean and Environment.

Courses are taught by faculty from Marine Policy, Physical Ocean Science and Engineering, Mechanical Engineering, Electrical Engineering, Geological Sciences, and Geography. The program is designed to give a broad understanding of the wind energy industry from multiple disciplinary perspectives. The emphasis is on offshore wind power, however, most courses apply equally to wind power either on land, in the ocean, or airborne. The certificate may be taken in conjunction with a graduate degree in a traditional discipline or as a stand-alone program. More information on the graduate certificate program can be found below and in the program brochure.

The Graduate Certificate is designed for **three types of students:**

- Students considering or already accepted in a graduate UD program looking for formal recognition of their wind power expertise
- For students focused on one specific area of wind power research it provides coverage of related areas allowing for improved understanding of interacting systems
- Working professionals, who need to understand more about the wind industry, to more effectively do their jobs or seek advancement.

Certificate Courses

Required Interdisciplinary Course

MAST628 Offshore Wind Power: Science, Engineering, and Policy (3 Credits)

This course, like the program of research and study, is highly interdisciplinary. Example content of the course can be seen from the 2012 syllabus. Taught by Professors Jeremy Firestone, Willett Kempton, and Dana Veron. Final group papers are one way to judge a graduate course. Linked here are two from the first time the course was offered, 2005. Both include resource assessments and other analyses, one for Florida offshore winds and ocean currents, and one Assessment of Delaware Offshore Wind Power. Although these are student papers, they are original, very substantial and have interesting preliminary

findings. The second paper, as well as one written by students in 2010, formed the basis for student first-authored peer review publications. Assessing offshore wind resources: An accessible methodology and Cost Minimized Combinations of Wind, Solar and Storage.

Wind Power Science Courses

ELEG615 Electric Power and Renewable Energy Systems (3 credits)

This course provides an introduction to electric power systems and interfaces with renewable energy sources. Covers electric power generation, transmission, and distribution; residential, commercial and industrial systems; and components, operation, losses, metering, and load management.

GEOL663 Geological Aspects of Offshore Wind Power (3 credits)

Investigation of the geological and geotechnical aspects of offshore wind projects. Emphasis is placed on the influence of geology and physical properties of sediments and rocks on offshore wind project site selection, design, construction, and operation. Taught by Professor [John Madsen](#). Click here for the [syllabus](#).

MAST613 Wind Power Meteorology (3 credits)

This course explores the fundamental concepts of meteorology that are needed to understand onshore, offshore, and airborne wind energy. Topics include: forces affecting winds; terrain and land-use effects; air turbulence; numerical modeling; wind power and energy from turbines; and wind measurement technologies. Taught by Professor [Cristina Archer](#). Click here for the [syllabus](#).

Wind Power Engineering Courses

ELEG614 Basic Electrical Machines and Power (1 credit)

Provides a basic understanding of electrical machines, including motors and generators, and electrical power, to a non-electrical engineer, starting from basic physical principles. Knowledge of elementary calculus and vectors is required. Taught by Professor [Keith Goossen](#). Click here for the [outline of the class](#).

MEEG635 Wind Power Engineering (3 credits)

Lecture course on engineering aspects of modern large wind turbines taught by Professor [Leonard Schwartz](#). Offered in mechanical engineering, this course covers the mechanics, aerodynamics, and electrical characteristics of wind turbines. For texts and topics, see the [syllabus](#).

MEEG622 Materials Tribology (3 credits)

Materials tribology concerns the material's response to sliding or tribological contact.

Moving systems become immobile when tribological materials fail. This course provides an introduction to tribology, imparts a basic understanding of interfacial phenomena, and surveys emerging interface challenges in aerospace, wind power, and osteoarthritis applications. This course is taught by Professor [David Burris](#).

Wind Power Policy Courses

ENEP802/UAPP802 Electricity Policy and Planning (3 credits)

Analyzes the technological and regulatory policy evolution of the electricity industry. Considers how technology innovations and policy/regulatory actions have guided the planning of the industry from its early days.

MAST680 Renewable Energy & Climate: Law, Regulation & Environment (1-3 credits)

This course covers US laws and regulations pertaining to the generation, transmission, and integration of renewable energy into the electrical, transportation and building heat systems and the regulation of greenhouse gases. The course primarily draws on judicial opinions but also considers technical and scientific sources. Taught by Professor [Jeremy Firestone](#). Click here for 2013 [Syllabus](#).

MAST692/UAPP692 Environmental Values, Movements & Policy (3 credits)

Examines citizens' beliefs and values, voluntary environmental groups and the ways in which individuals and groups affect environmental policy. Shows how research in areas such as environmental sociology and ecological anthropology can inform policy. Offered by Professor [Willett Kempton](#). Click here for the 2014 [Syllabus](#).

MAST622/UAPP622 Conservation and Renewable Energy Policy (3 credits)

Covers current policy issues for energy conservation, energy efficiency, and renewable energy sources. Some prior background in energy policy is assumed. Topics include environmental impacts, utility programs, and international comparisons. Taught by Professor [Willett Kempton](#). For readings and detailed topics, see the Spring 2011 [syllabus](#).

Certificate information

Admission requirements:

Undergraduate degree from an accredited college or university. For more information on applying, please email [Dr. John Madsen](#).

Certificate requirements:

A total of **12 credits** from courses relating to wind power.

Specific course/credit requirements are:

1. 3 credits from the required interdisciplinary course:
MAST628 Offshore Wind Power: Science, Engineering, and Policy

2. At least 2 credits from courses within each of the focus areas:

- Wind Power Science
- Wind Power Engineering
- Wind Power Policy