

Wind Power System Operation & Maintenance

This 12-credit graduate certificate program will be composed of four courses specialized on wind plant operation and inspection. Students in this Certificate program will learn to monitor and maintain the operation of a wind farm with the latest inspection and data analytic technologies to keep wind turbines running smoothly with minimum downtime. The program will look into the topic of interconnecting wind power project with the power grid and learn about the Regional Transmission Operator (RTO) process. They will study the behavior of the wind power system under conditions such as sudden changes in load or generation or short circuits on transmission lines and how to control and achieve resilience.

Who would be suited to take this program?

Students and professionals interested in a career in the offshore wind industry could enroll in this program to receive training needed for a competitive offshore wind workforce. According to the report “New York State and the Jobs of Offshore Wind Energy” published by the Workforce Development Institute, professional education beyond bachelor degree is required for many occupations in offshore wind; examples include engineering manager, chief engineer and operation manager. The report “U. S. Offshore Wind Workforce Assessment” published by the National Renewable Energy Laboratory in October 2022, points out that offshore wind occupations like finance managers, engineers, researchers, and developers, safety officers, information technologists, permitting coordinators, etc., will need education that will be offered by universities. According to the U. S. Department of Energy’s *Wind Vision* report (<https://www.energy.gov/eere/wind/wind-vision>) and an article published in the journal *Wind Engineering* (“Graduate and undergraduate university programs in wind energy in the United States”, vol. 43, page 35-46, 2019), the United States may need more than 50,000 university-educated professionals with advanced degrees to support wind energy development by 2030.

What are the prerequisites?

Students with backgrounds in electrical engineering, physical sciences, or engineering technology are well matched to take this program to acquire project management knowledge to transition into the booming offshore wind industry.

What will I learn?

This Program will address and highlight the entire HVDC cable life cycle, system design parameters, materials, joints and terminations, installation on land and subsea, asset management of HVDC power cables in operation. It will provide technical analysis of interoperability and pros and cons of each possible technical solution to provide a well-rounded view of the issue. It will cover topics such as grid codes, power system balancing, and integration of fluctuating renewables into power grid. The students will learn the fundamentals of wind turbine generator dynamics and transient stability analysis, small and large disturbance stability. The topics will be explained with theoretical aspects as well as hand calculations so that the students can grasp the concepts more easily. We will also explore systemic principles of wind power system management, such as the role of smart grid, data-enabled machine learning, power electronics-control, and data-driven decision-making.

Why study offshore wind at NJIT?

This is the first graduate certificate program developed in New Jersey for offshore wind power management. NJIT is well connected with New Jersey State Government offices, offshore wind developers, transmission developers, and offshore supply chain companies in its efforts to prepare students for a career in the offshore wind industry. For the development of certificate programs targeting offshore wind workforce training, NJIT is in the process of forming an advisory board involving government, industry and academia. Besides, students can also take advantage of the offshore wind events that NJIT has been organizing, including a biannual 2-day offshore wind bootcamp training, an annual offshore wind technology conference, and an annual offshore wind career exhibition. Participants can interact with industry experts and network with project managers.

Potential employment:

Operation Specialties Managers

Plant and System Engineers

Operating Engineers

Stationary Engineers

Code	Title	Credits
Core Courses		
Select two of the following		
ECE 651	Wind Power Transmission and Grid Interconnection	3
ECE 652	HVDC Design, Operation and Maintenance	3
ECE 656	Power System Dynamics	3
Elective Courses		
Select two of the following		
ECE 610	Power System Steady-State Analysis	3

ECE 611	Transients in Power Systems	3
ECE 613	Protection of Power Systems	3
ECE 616	Power Electronics	3
ECE 617	Economic Control of Interconnected Power Systems	3
ECE 618	Photovoltaic Semiconductors and Renewable Energy	3
ECE 619	Intelligent Sensing for Smart Grid and Smart City	3
ECE 637	Internet Protocols and their Evolution with Artificial Intelligence	3
ECE 654	US Offshore Renewable Energy Policy	3
ECE 656	Power System Dynamics	3
ECE 670	Management Strategies in the Offshore Wind Industry	3
ECE 671	Wind Plant Project Development	3
ECE 698	Selected Topics in Electrical and Computer Engineering	3
ME 607	Advanced Thermodynamics	3
CHE 611	Thermodynamics	3
ENE 671	Environmental Impact Analysis	3
IE 614	Safety Engineering Methods	3
MGMT 620	Strategic Management of Technological Innovation	3
MGMT 692	Strategic Management	3
ECE 725	Independent Study I (for doing a technical project jointly identified by NJIT and the offshore wind industry)	3
MGMT 635 or CS 634	Data Mining and Analysis Data Mining	3