

## ECO 612

### Offshore Wind Energy – Project Economics, Deployment, and Business Logistics

**Meeting Time:**

Online, Asynchronous

**3 Credits****Instructor:**

TBD

**Weekly Online Synchronous Sessions:**

Office hours, content review, guest speakers or on-line contact time

**Course Description:**

Construction of an offshore wind farm raises significant financing and insurance issues, and requires a well-established local workforce, supply chain, and infrastructure. Wind industry professionals must understand this complex process to make informed decisions on planning and construction of offshore wind development. This course will touch on the critical aspects of getting an offshore wind farm up and running, from the planning stages until construction is complete and the wind farm is operational.

The on-line course will consist of recorded lectures with slides, assigned readings, problem sets, and two exams. Students will engage with the instructor and fellow students through robust on-line discussion sessions and postings.

**Learning Objectives:**

Upon successful completion of this module, students will understand:

- Capital cost, levelized cost of energy, and revenue cash flows of offshore wind projects;
- Financial structures for development, construction, operations;
- Financial risks and mitigation: insurance, long term contracts, energy market hedges;
- Federal and state policy incentives and ISO-NE market structures for offshore wind;
- Offshore wind supply chain: current status and emerging needs;
- Workforce needs: number and description of jobs;
- Safety and training requirements and standards, and educational programs;
- Supply chain coordination and build up;
- The Jones Act;
- Project and construction management;
- Port-side fabrication of offshore wind subsystems;
- Port deployment and construction procedures;
- Cable-laying, substations, subfloor transmission, interconnection;
- Project commissioning; and operations and maintenance.

## Reading Materials:

*(draft list of materials, to be further developed with final on-line course development)*

2018 Offshore Wind Technologies Market Report, U.S. Department of Energy, Musial, et. al.

Is the supply chain ready for the green transformation? The case of offshore wind logistics, Poulsen and Lema, Renewable and Sustainable Energy Reviews, Elsevier, Volume 73, June 2017, Pages 758-771.

Introduction to Offshore Wind – Development, Construction and Operations, Sophie Hartfield Lewis, Orsted, NYSERDA Workshop, 2018.

Offshore Wind Handbook, Version 2, K&L Gates (industry), October 2019.

U.S. Offshore Wind Manufacturing and Supply Chain Development, Navigant Consulting, prepared for the U.S. Department of Energy, 2013.

Additional readings will be assigned from academic literature and professional and governmental reports on present-day offshore project development. Readings will draw from current literature on offshore wind project economics, policy, and financing, and on logistics of supply chain management for project development and the workforce preparedness and regulations for project deployment. Literature will draw from offshore wind development in Massachusetts and the eastern U.S. coast, and from a longer history of development in Europe.

## Course Outline:

Week	Day/Date	Topic	Assignment	Due Date
1		Offshore wind system costs, energy generation and prices, levelized cost of energy analysis	HW1	
2		Power purchase agreements, offshore wind financing structures	HW2	
3		ISO New England electricity markets, federal/state incentive programs	HW3	
4		Financial risks/mitigation, insurance	HW4	
5		Supply chain modeling and development status	HW5	
6		Workforce needs, training, and certifications	Exam 1	

7	Installation vessel and port requirements and hiring, overseas logistics, The Jones Act	HW6
8	Project and construction management	HW7
9	System fabrication	HW8
10	Turbine and electric system deployment	HW9
11	Operations and maintenance procedures	HW10
12	Commissioning/start-up process	
13	Class review	Exam 2

### **Course Policy and Requirements:**

This course does not have any predetermined scheduled meeting times and the course site and modules can be accessed at any time during the semester. A weekly course calendar is provided to suggest the reading and lecture schedule. However, homework assignments and exams will be subject to strict timeframes and due dates, and will not be accepted late without express advance permission from the instructor. Homework assignments will be graded with feedback provided.

There will be 5-10 homework sets given during the course of the semester. There also will be one mid-term exam, and one final exam. The exams will be taken on your own time but during a prescribed time period. All homework sets and exams will be subject to the UMass Academic Honesty Policy, and work is to be completed individually by each student.

Homework sets and exams are required to be submitted as PDF files through Moodle, and will undergo similarity checks.

### **Grading Scale and Criteria:**

Individual grades for the course will be based on the following scale.

A	93-100%
A-	90-92%
B+	87-89%
B	83-86%
B-	80-82%
C+	77-79%
C	73-76%

F Per policy of the Graduate School, grades below a C will result in a failing grade

Students who are taking the course as an elective graduate course, and who are not taking the course in fulfillment of the Offshore Wind Professional Certificate, may elect to take the course as an Optional Letter Grade (OPG).

The weights of course assignments and activities are as follows.

Exam 1	25%
Exam 2	25%
Participation	10%
<u>Homework</u>	<u>40%</u>
<b>Total</b>	<b>100%</b>

\*As an on-line course, participation will be evaluated based on 1) evidence (available from the on-line platform) that the students has spent the expected time engaged with each asynchronous module/lecture, 2) student engagement in accessing and contributing to on-line posts prompted throughout the course, and 3) active engagement of student in weekly real-time discussion sessions with instructor.

#### **Academic Honesty Policy Statement:**

The integrity of the academic enterprise of any institution of higher education requires honesty in scholarship and research, and academic honesty is required of all students at the University of Massachusetts.

Academic dishonesty is prohibited in all programs of the University. Academic dishonesty includes but is not limited to: cheating, fabrication, plagiarism, and facilitating dishonesty. Appropriate sanctions may be imposed on any student who has committed an act of academic dishonesty. Instructors should take reasonable steps to address academic misconduct. Any person who has reason to believe that a student has committed academic dishonesty should bring such information to the attention of the appropriate course instructor as soon as possible. Instances of academic dishonesty not related to a specific course should be brought to the attention of the appropriate department Head or Chair.

For more information about what constitutes academic dishonesty, please see <https://www.umass.edu/honesty/>.

The procedures outlined at the website listed above are intended to provide an efficient and orderly process by which action may be taken if it appears that academic dishonesty has occurred and by which students may appeal such actions. Since students are expected to be familiar with this policy and the commonly accepted standards of academic integrity, ignorance of such standards is not normally sufficient evidence of lack of intent.

**Accommodations:**

The University of Massachusetts is committed to making reasonable, effective and appropriate accommodations to meet the needs of students with disabilities and help create a barrier-free campus. If you are in need of accommodation for a documented disability, register with Disability Services to have an accommodation letter sent to your faculty. It is your responsibility to initiate these services and to communicate with faculty ahead of time to manage accommodations in a timely manner. For more information, consult the Disability Services website at <http://www.umass.edu/disability/>.