

**Course offered by the PhD program
in Civil, Chemical and Environmental Engineering
a.y. 2025/2026 (41 cycle)**

(course is open for participation of students from other PhD cycles or programs)

1. Title

Engineering in the installation of offshore wind turbines

2. Course Objectives and Description

The course deals with the installation of offshore wind turbines from the prospective of structural engineers who are called to develop strategies to mitigate or cope with environmental actions, primary due to wind, waves and earthquakes. The course starts with an overview of the offshore wind energy along with a short description of how a wind turbine functions and its components (tower, nacelle and blades). The primary focus is on the operations executed in the port pre-assembly area, where turbine components arriving from the factory are temporarily stored and prepared to be loaded onto installation vessels. Furthermore, challenges related to the sea transport of the components in general, and related to the turbine towers erected on the deck of installation vessels in particular, are described. Finally, common issues in the assembly of turbine components on offshore foundations are presented along with potential solutions. Below the list of the course parts:

1. Introduction of offshore wind turbines and pre-assembly area in ports.
2. Wind related issues at pre-assembly areas.
3. Seismic actions at pre-assembly area.
4. Loads on the turbine components during sea transit and offshore assembling.
5. Knowledge frontier and innovative dampers for quayside tower foundations.

3. Course Organization

The course is structured into five parts, each consisting of four lectures lasting 60 minutes, for a total duration of 20 hours. All lectures will be delivered in the classroom. Assignments will be given to students daily and discussed in class the following day. Each assignment addresses an issue/problem related to one of the topics covered during that day's lecture. Students are expected to propose a solution using sketches, a brief written description, or bullet points. Given the complexity of the tasks, each assignment is designed to require approximately one hour of work. Completed assignments will be reviewed in class the following day and will form part of the material assessed in the final examination.

4. Teacher

Dr. Alessio Torrielli.

5. Duration and credits

20 hours (4 credits).

6. Activation mode and teaching period

24-28 November, 2025.

7. Deadline for registration

17 November, 2025. Please contact ale.torrielli@gmail.com and Federica.tubino@unige.it to register.

8. Final exam

Oral examination.