280821 - Marine Foundations

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering
Academic year: 2018
Degree: MASTER'S DEGREE IN NAVAL AND OCEAN ENGINEERING (Syllabus 2017). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: English

Teaching staff

Coordinator: MARCOS ARROYO ALVAREZ DE TOLEDO
Others: Segon quadrimestre:
MARCOS ARROYO ALVAREZ DE TOLEDO - 1
CARLOS MARIA LOPEZ GARELLO - 1
ANNA RAMON TARRAGONA - 1
ENRIQUE EDGAR ROMERO MORALES - 1

Opening hours

Timetable: Mondays from 11:00h to 13:00h; by appointment

Degree competences to which the subject contributes

Basic:
CB6. Possess knowledge and understanding that provide a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
CB7. That the students can apply their knowledge and ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their study area.
CB8. Students should be able to integrate knowledge and handle the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the responsibilities social and ethical linked to the application of their knowledge and judgments.
Learning objectives of the subject

- Familiarity with basic soil mechanics principles relevant for offshore foundation design
- Familiarity with offshore geotechnical site investigation procedures and instruments. Awareness of main geohazards affecting offshore developments.
- Familiarity with pile design procedures relevant for the offshore environment. Knowledge of alternative offshore foundation types

Transversal:

- CT3. TEAMWORK: Ability to work as a member of an interdisciplinary team, either as a member or performing management tasks, with the aim of contributing to projects pragmatically and sense of responsibility, assuming commitments considering the resources available.
- CT4. EFFECTIVE USE OF INFORMATION RESOURCES: Manage the acquisition, structuring, analysis and visualization of data and information in the field of specialty, and critically evaluate the results of this management.
- CT5. THIRD LANGUAGE Learning a third language, preferably English, with adequate oral and written and in line with the future needs of the graduates.

Teaching methodology

4 different type of face-to-face sessions are included in the unit:
1. Theoretical session (T). In which the information relevant to the different topics covered in the syllabus is exposed and discussed in the classroom
2. Exercise session (P). Dedicated to solve application exercises in the classroom
3. Laboratory session (L). Taken place in the soil mechanics laboratory where the class is divided in teams to perform simple soil mechanics tests.
4. Personal work presentation (E). The students present the results of their own research work at the classroom.

The students are expected to:
1. Study the contents of the theoretical and exercise sessions
2. Attend the laboratory sessions and report back on their activity during them
3. Hand back a design exercise assigned by groups. The exercise typically consists on the evaluation of some foundation design problem with help from commercial "ad hoc" software (OPILE)
4. Hand back and present a short research assignment which is distributed in the classroom (individually or to two persons, depending on its difficulty and length)
280821 - Marine Foundations

<table>
<thead>
<tr>
<th>Study load</th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 45h</td>
<td>Hours large group:</td>
<td>45h</td>
</tr>
<tr>
<td></td>
<td></td>
<td>100.00%</td>
</tr>
</tbody>
</table>
# Content

## Introduction

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 3h</th>
</tr>
</thead>
</table>
| Offshore foundations: tipology.  
The offshore geotechnical environment.  
Geohazards  
Normatives | Theory classes: 3h |

## Soil mechanics

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 12h</th>
</tr>
</thead>
</table>
| Soil description and classification.  
Groundwater flow and permeability.  
Soil strength  
Soil stiffness | Theory classes: 6h  
Laboratory classes: 6h |

<table>
<thead>
<tr>
<th>Related activities:</th>
<th>Specific objectives:</th>
</tr>
</thead>
</table>
| Laboratory 1: identification of soils  
Laboratory 2: flux of water through soils | Familiarize the student with the fundamental concepts of soil mechanics relevant for the offshore environment |

## Offshore site investigations

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 4h 30m</th>
</tr>
</thead>
</table>
| Geophysics  
Probing: the CPTu. Other probes  
Sampling techniques  
Laboratory testing | Theory classes: 4h 30m |

<table>
<thead>
<tr>
<th>Related activities:</th>
<th>Specific objectives:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Some topics may be developed through individual research work</td>
<td>Gain familiarity with the techniques of geotechnical investigation relevant for the offshore environment</td>
</tr>
</tbody>
</table>
### Offshore pile foundations

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Types of piles</td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Pile installation</td>
<td>Practical classes: 6h</td>
</tr>
<tr>
<td>Axial capacity</td>
<td></td>
</tr>
<tr>
<td>Lateral capacity</td>
<td></td>
</tr>
<tr>
<td>Effect of cyclic loading</td>
<td></td>
</tr>
</tbody>
</table>

| Related activities: | |
|---------------------| |
| Team design work with OPILE code | |

### Direct foundations for offshore structures

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 12h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gravity base</td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td>Suction caissons</td>
<td>Practical classes: 6h</td>
</tr>
<tr>
<td>Jack up</td>
<td></td>
</tr>
</tbody>
</table>

### Qualification system

The final grade (0-10) is obtained as a weighted average of the following items:

1. Laboratory (attendance) 10%
2. Laboratory (reports) 10%
3. Group design exercise (15%)
4. Research report and presentation (15%)
5. Final exam (50%)

The final exam typically includes an exercise and several theoretical questions.

### Bibliography

**Basic:**


**Others resources:**

- OPILE (Software for pile design oriented to offshore structures)