Course guides  
250576 - TEXPECAMLA - Experimental Techniques in Laboratory and Field

Unit in charge: Barcelona School of Civil Engineering  
Teaching unit: 751 - DECA - Department of Civil and Environmental Engineering.  
Degree: BACHELOR’S DEGREE IN MARINE SCIENCE AND TECHNOLOGY (Syllabus 2018). (Compulsory subject).  
Academic year: 2020  
ECTS Credits: 6.0  
Languages: Catalan, Spanish

LECTURER

Coordinating lecturer: FRANCESC XAVIER GIRONELLA I COBOS  
Others: IVAN CACERES RABIONET, FRANCESC XAVIER GIRONELLA I COBOS, VICENTE GRACIA GARCIA

DEGREE COMPETENCES TO WHICH THE SUBJECT CONtributes

Specific:
13388. To know and apply the lexicon and concepts of the Marine Sciences and Technologies and other related fields.  
13390. Establish a good practice in the integration of common numerical, laboratory and field techniques in the analysis of any problem related to the marine environment.  
13394. Address the most relevant processes and their interactions related to their physical / chemical / biological / geological components, applying technical and scientific knowledge and criteria.  
13397. Carry out environmental impact, management and protection studies of the marine environment and adjacent coastal areas, including the corresponding infrastructures and their related impacts.  
13403. Develop a conceptual framework to address the sustainability of the marine environment and the related socio-economic activities at different scales, explaining the effects of climate change.  
13404. Set, plan and execute basic and applied research in the field of Marine Sciences and Technologies.  
13405. Carry out calculations, assessments, surveys and inspections in coastal and marine environments, as well as the corresponding technical documents.  
13406. Write technical reports and disseminate knowledge about the different components of the marine system, considering the applicable legal framework.

Generical:
13382. Apply state-of-the-art methods and techniques in oceanography and marine climate, jointly covering the physical, chemical, geological and biological aspects.  
13383. Develop a conceptual framework that links the scientific-technological and management aspects for marine resources, explaining the interactions with marine infrastructures and management plans in coastal areas.  
13384. Apply knowledge and academic experience to the control and monitoring of the marine environment and its coastal boundary, using the state-of-the-art tools in the Marine Sciences and Technologies.  
13386. Encompass and teach studies in the different research lines that converge in Marine Sciences and Technologies.  
13387. Combining preservation with economic activity within the framework of current legislation promoting the development of a social and environmental awareness.
TEACHING METHODOLOGY

The course consists of 2.3 hours per week of classroom activity (large size group) and 1.2 hours weekly with half the students (medium size group).

The 2.3 hours in the large size groups are devoted to theoretical lectures, in which the teacher presents the basic concepts and topics of the subject, shows examples and solves exercises.

The 1.2 hours in the medium size groups is devoted to solving practical problems with greater interaction with the students. The objective of these practical exercises is to consolidate the general and specific learning objectives.

The rest of weekly hours devoted to laboratory practice.

Support material in the form of a detailed teaching plan is provided using the virtual campus ATENEA: content, program of learning and assessment activities conducted and literature.

To do the laboratory practices you need the following personal protective equipment (PPE):
* Blue lab coat UPC Mechanical
* Protection gloves - Mechanical

LEARNING OBJECTIVES OF THE SUBJECT

This subject will show the most relevant aspects of observation field campaigns and the methods of experimentation in a physical laboratory on a reduced scale, as indispensable tools in meteo-oceanographic studies, as well as the complementarity between both disciplines. The students will be shown how to design and execute field measurement campaigns, emphasizing the spatial and temporal scales of the processes to be studied, as well as the type of measures that are required, either for characterization or to obtain essential data for numerical simulations. On the other hand, the most relevant aspects of laboratory experimentation will be shown, highlighting important aspects related to experimental design, scale effects, operability, etc. In both cases, students will be shown the measuring devices, their implementation, their scope and limitations and the combination of field and laboratory experiments to generate added value.

1.- Design the work campaigns in the field, solve the logistics of the activities of the different scientific teams involved, know the respective action protocols as well as organize and direct the correct execution of the scheduled tasks.
2.- Understand the problems related to scale and laboratory effects for the correct interpretation of the results and possible comparison with field results.
3.- Carry out laboratory measurements following pre-established protocols, estimate systematic and random errors and make a report relative to a measuring process and its analysis.

This subject is focused on showing, familiarizing and training students with techniques of observation, monitoring, acquisition and treatment of marine data, as well as modeling techniques, physical and numerical, which allow to characterize practically all of the real problems that will have to address in the professional practice and that will allow the students to finish a generic training cycle but with advanced and transversal knowledge in Sciences and Technologies of the Sea.

Around the most relevant variables, know why they are measured and how they are measured. Design the work campaigns in the field, solve the logistics of the activities of the different scientific teams involved, know the respective action protocols, as well as organize and direct the correct execution of the scheduled tasks. Understand problems related to scale and laboratory effects for the correct interpretation of results and possible comparison with field results. Carry out laboratory measurements following pre-established protocols, estimate systematic and random errors and carry out a report on a measurement process and its analysis.

STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours medium group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>30,0</td>
<td>20.00</td>
</tr>
<tr>
<td>Hours small group</td>
<td>15,0</td>
<td>10.00</td>
</tr>
<tr>
<td>Guided activities</td>
<td>6,0</td>
<td>4.00</td>
</tr>
<tr>
<td>Type</td>
<td>Hours</td>
<td>Percentage</td>
</tr>
<tr>
<td>--------------</td>
<td>-------</td>
<td>------------</td>
</tr>
<tr>
<td>Self study</td>
<td>84,0</td>
<td>56.00</td>
</tr>
</tbody>
</table>

**Total learning time:** 150 h

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### Introduction

**Description:**
Temari  
Variables and processes. Time and space scales  
Practice

**Full-or-part-time:** 12h  
Theory classes: 3h  
Practical classes: 2h  
Self study : 7h

### Scale laws

**Description:**
Laws of scale and Pine Theorem  
Laws of scale and Pine Theorem

**Full-or-part-time:** 12h  
Theory classes: 2h  
Practical classes: 3h  
Self study : 7h

### Facilities I

**Description:**
Docks, vessels, satellites

**Full-or-part-time:** 4h 48m  
Theory classes: 2h  
Self study : 2h 48m

### Facilities II

**Description:**
Flumes, basins

**Full-or-part-time:** 4h 48m  
Theory classes: 2h  
Self study : 2h 48m
<table>
<thead>
<tr>
<th>Topic</th>
<th>Description</th>
<th>Full-or-part-time</th>
<th>Theory classes</th>
<th>Practical classes</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Meteorology</strong></td>
<td>Relevance of meteorology and workstations</td>
<td>4h 48m</td>
<td>2h</td>
<td></td>
<td>2h 48m</td>
</tr>
<tr>
<td><strong>Sea level and waves</strong></td>
<td>Zero reference (bathymetries / structures). Equipment: visual, tide gauges, radars, pressure sensors, resistive sensors, capacitive sensors, acoustic</td>
<td>16h 48m</td>
<td>3h</td>
<td>4h</td>
<td>9h 48m</td>
</tr>
<tr>
<td><strong>Chemical and biological variables</strong></td>
<td>Chemical and biological variables</td>
<td>4h 48m</td>
<td>2h</td>
<td></td>
<td>2h 48m</td>
</tr>
<tr>
<td><strong>Bathymetries</strong></td>
<td>Measurement equipment and data</td>
<td>16h 48m</td>
<td>4h</td>
<td>3h</td>
<td>9h 48m</td>
</tr>
<tr>
<td><strong>Currents</strong></td>
<td>Measurement equipment and data</td>
<td>9h 36m</td>
<td>2h</td>
<td>2h</td>
<td>5h 36m</td>
</tr>
</tbody>
</table>
**Sediment transport**

**Description:**
- Sea Sediment Transport (by bottom and suspension)
- Wind sediment transport (rolling, jumping, suspension)

**Practice**

**Full-or-part-time:** 14h 23m
- Theory classes: 4h
- Practical classes: 2h
- Self study: 8h 23m

**Structures**

**Description:**
- Overtopping, forces and stability

**Practice**

**Full-or-part-time:** 19h 12m
- Theory classes: 4h
- Practical classes: 4h
- Self study: 11h 12m

**Laboratories**

**Description:**
- Laboratories

**Full-or-part-time:** 14h 23m
- Laboratory classes: 6h
- Self study: 8h 23m

**Evaluations**

**Full-or-part-time:** 9h 36m
- Laboratory classes: 4h
- Self study: 5h 36m

**GRADING SYSTEM**

The mark of the course is obtained from the ratings of continuous assessment and their corresponding laboratories and/or classroom computers.

Continuous assessment consists of several activities, both individually and in group, of additive and training characteristics, carried out during the year (both in and out of the classroom).

The teachings of the laboratory grade is the average in such activities.

The evaluation tests consist of a part with questions about concepts associated with the learning objectives of the course with regard to knowledge or understanding, and a part with a set of application exercises.
EXAMINATION RULES.

Criteria for re-evaluation qualification and eligibility: Students that failed the ordinary evaluation and have regularly attended all evaluation tests will have the opportunity of carrying out a re-evaluation test during the period specified in the academic calendar. Students who have already passed the test or were qualified as non-attending will not be admitted to the re-evaluation test. The maximum mark for the re-evaluation exam will be five over ten (5.0). The non-attendance of a student to the re-evaluation test, in the date specified will not grant access to further re-evaluation tests. Students unable to attend any of the continuous assessment tests due to certifiable force majeure will be ensured extraordinary evaluation periods.

These tests must be authorized by the corresponding Head of Studies, at the request of the professor responsible for the course, and will be carried out within the corresponding academic period.

BIBLIOGRAPHY

Basic: