Degree competences to which the subject contributes

Transversal:

1. TEAMWORK: Being able to work in an interdisciplinary team, whether as a member or as a leader, with the aim of contributing to projects pragmatically and responsibly and making commitments in view of the resources that are available.
2. EFFECTIVE USE OF INFORMATION RESOURCES: Managing the acquisition, structuring, analysis and display of data and information in the chosen area of specialisation and critically assessing the results obtained.
3. FOREIGN LANGUAGE: Achieving a level of spoken and written proficiency in a foreign language, preferably English, that meets the needs of the profession and the labour market.

Teaching methodology

- Lectures
- Collaborative lecture
- Laboratory practical work
- Project based learning
- Autonomous work
- Tutoring
- Extended answer test (Final Exam)

Learning objectives of the subject

Learning objectives of the subject:

At the end of this matter is expected that the student be able to practically apply the knowledge and skills of the degree to electronic systems used in the marine environment. It is expected that the student is able to demonstrate knowledge of special methods of acquisition and transmission of information, and the design of the measuring instruments involved in the fields of research and technological development and fisheries oceanography. It will also be able to distinguish and differentiate the different types of underwater observation infrastructures as networks of sensors and underwater vehicles. In addition the student will demonstrate an understanding of the general concepts of the marine environment that affect climate change, sustainability of biological systems and the monitoring of natural hazards.

The aim of this course is to train students in methods of design, dimensioning and evaluation of data communications networks. First, we consider the parameters of interest for telematics network planning and mathematical tools we have. Then, using this knowledge, will study data routing mechanisms, network allocation capacity, congestion control and
multiple access techniques.
- Ability to understand and interpret the functioning technical characteristics of the measuring equipment most commonly used in the marine environment (CTDs, hydrophones, etc.).
- Ability to understand the need of underwater robotics and interpret technical and operational characteristics of the different vehicles. ROV, AUV and Gliders.
- Ability to perform the specification, implementation, documentation and commissioning of equipment and systems, considering both the technical and corresponding regulatory standards.
- Ability to specify, design and use, electronic instrumentation and measurement systems applied to the marine environment, both in research and application through to the fishing fleet.
- Ability to perform the specification, implementation and commissioning of equipment and systems for autonomous underwater vehicle.
- Capacity to analyzes the needs of power consumption and power measuring equipment, for optimization and increase autonomy.
- Ability to understand the different environmental parameters involved in climate change.

<table>
<thead>
<tr>
<th>Study load</th>
<th>Total learning time: 125h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours large group:</td>
<td>13h</td>
</tr>
<tr>
<td>Hours medium group:</td>
<td>0h</td>
</tr>
<tr>
<td>Hours small group:</td>
<td>26h</td>
</tr>
<tr>
<td>Guided activities:</td>
<td>0h</td>
</tr>
<tr>
<td>Self study:</td>
<td>86h</td>
</tr>
</tbody>
</table>
# Content

## 1. Introduction to oceanographic measurement systems

**Learning time:** 10h  
Theory classes: 3h  
Self study: 7h

**Description:**  
Characteristics, applications and technology challenges

## 2. The marine environment

**Learning time:** 16h  
Theory classes: 2h  
Laboratory classes: 2h  
Self study: 12h

**Description:**  

## 3. Underwater acoustic Communications

**Learning time:** 19h  
Theory classes: 5h  
Laboratory classes: 2h  
Self study: 12h

**Description:**  

## 4. Marine technology for scientific studies and environmental management

**Learning time:** 18h  
Theory classes: 3h  
Laboratory classes: 2h  
Self study: 13h
## 5. Infrastructure for observation

**Learning time:** 20h  
Theory classes: 5h  
Laboratory classes: 2h  
Self study: 13h

**Description:**
Marine sensor networks. Smart sensors (IEEE 1451) for the measurement of physical and/or chemical parameters, compatible with cabled observatories connection (OBSEA). Presentation of current standards promoted by OGC (Open Geospatial Consortium) or GEOSS as SensorML. Synchronization in sensor network. NTP (Network Time Protocol). Or IEEE 1588 PTP (Precision Time Protocol).

## 6. Underwater vehicles

**Learning time:** 20h  
Laboratory classes: 2h  
Self study: 5h  
Self study: 13h

**Description:**

## 7. Navigation sensors and payload

**Learning time:** 22h  
Theory classes: 6h  
Laboratory classes: 3h  
Self study: 13h

**Description:**
Planning of activities

<table>
<thead>
<tr>
<th>LABORATORY 1</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
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</table>

<table>
<thead>
<tr>
<th>LABORATORY 2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
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<table>
<thead>
<tr>
<th>LABORATORY 3</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>Introduction to communication systems. Transducers and acoustic modems. Release systems. Acoustic systems employed in the fisheries sector. Sounders.</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>LABORATORY 4</th>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
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</table>

<table>
<thead>
<tr>
<th>LABORATORY 5</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>Presentation Guanay II AUV. Identification of different subsystems. Commissioning and connection of control systems, propulsion and investment, communication, security, use of the graphical interface to mission control.</td>
</tr>
</tbody>
</table>

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<thead>
<tr>
<th>LABORATORY 6</th>
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</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
</tr>
<tr>
<td>Introduction to navigation systems. Calibration and communication of the various navigation sensors. INS, compass and inclinometer. Assembly and handling from the control unit.</td>
</tr>
</tbody>
</table>
Qualification system

Final examination: 20%
Exercises: 10%
Individual assessments: 15%
Group assessments: 15%
Laboratory assessments: 40%

Bibliography

Basic:


Others resources:

Scientific papers from Journal of Oceanic Engineering Society http://www.oceanicengineering.org