280723 - Marine Renewable Energies and Energy Optimization

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 709 - EE - Department of Electrical Engineering
Academic year: 2016
Degree: MASTER'S DEGREE IN THE MANAGEMENT AND OPERATION OF MARINE ENERGY FACILITIES (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits: 5  Teaching languages: Catalan, Spanish, English

Teaching staff
Coordinator: Díaz González, Francisco
Others: Díaz González, Francisco

Opening hours
Timetable: To be defined depending on the availability of students and professor.

Prior skills
Knowledge on electrical and energy systems.

Degree competences to which the subject contributes

Basic:

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.

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CB10. Students must possess the learning skills that enable them continue studying in a way that will be largely
At the end of the course, students:
- Should know the main characteristics of renewable generation and energy storage technologies to be included in ships, as well as the associated management systems.
- Should know and utilize mathematical expressions for the sizing of renewable generating systems and energy storage technologies in ships.
- Should know how to utilize tools for the modeling and simulation of electrical systems, including renewable generation and energy storage technologies in ships.
- Should know how to define a project related to the conceptualization, sizing and utilization of renewable generating systems and energy storage technologies in ships.

### Specific:

CTFM. Conduct, present and defend an original exercise done individually before a university tribunal, consisting of a comprehensive project of the Nautical Engineering and Maritime Transport, professional nature, in which the skills acquired in the teachings are synthesized.

CE2MEM. Apply the principles of renewable energy in marine installations.

CE4MEM. Identify and apply the principles of generation, transmission and distribution of energy.

CE6MEM. Analyze alternative solutions for the definition and optimization power plants and ship propulsion.

CE24MEM. Apply analytical and experimental research techniques.

### Generical:

CG4MEM. Implement alternative and innovative solutions to engineering problems marina.

### Transversal:

CT3. 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.

CT4. 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.

CT5. 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

To present and solve mathematical problems with the help (or not) of computers.

During the course, students should develop an individual project to apply the concepts presented in magistral classes. This consists on developing a project on the integration of renewable generating systems and energy storage technologies in a ship. At the end of the course, students should do an oral presentation for the results of the project.

### Learning objectives of the subject

At the end of the course, students:

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

### 1. Presentation of the subject. Introduction to the electrical plant for ships with renewable generation and energy storage technologies. Calculation of representative magnitudes.

**Description:**
Introduction to the subject and review of fundamental concepts for the proper development of the subject.

**Related activities:**
Selection of the topic for the project to be developed individually during the course.

**Specific objectives:**
To review fundamental concepts.

<table>
<thead>
<tr>
<th>Learning time: 7h</th>
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<tbody>
<tr>
<td>Theory classes: 1h 30m</td>
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<tr>
<td>Guided activities: 0h 30m</td>
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<tr>
<td>Self study: 5h</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Learning time: 30h 30m</th>
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</thead>
<tbody>
<tr>
<td>Theory classes: 8h</td>
</tr>
<tr>
<td>Guided activities: 3h 30m</td>
</tr>
<tr>
<td>Self study: 19h</td>
</tr>
</tbody>
</table>

**Description:**
Main operating principles, characteristics, technologies that can be found in the market, basic calculations for dimensioning, description of simulation models.

**Related activities:**
Project to be developed individually. Short practical activities.

**Specific objectives:**
To gain knowledge on renewable generation and energy storage technologies.

### 3. Management systems for renewable generation, energy storage and energy optimization.

<table>
<thead>
<tr>
<th>Learning time: 7h 30m</th>
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<tbody>
<tr>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td>Guided activities: 0h 30m</td>
</tr>
<tr>
<td>Self study: 3h</td>
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</table>

**Description:**
Management and monitoring systems associated to the renewable generation and energy storage technologies are described.

**Related activities:**
Project to be developed individually. Short practical activities.

**Specific objectives:**
To identify management technologies in ships and its importance and functionality.
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Qualification system

Final exam = 40%
Short practical activities = 20%
Project = 40%

Regulations for carrying out activities

The usage of calculator is needed for the final exam. Reports for practical activities can be elaborated in groups. The project should be done individually. It is mandatory to assist to the final exam.

Bibliography

Basic: