280665 - Ship Power Plant

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 709 - DEE - Department of Electrical Engineering
Academic year: 2020
Degree: BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010).
(Teaching unit Compulsory)
BACHELOR'S DEGREE IN MARINE TECHNOLOGIES/BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2016). (Teaching unit Compulsory)
ECTS credits: 4,5  Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: Pau Casals i Torrens
Others: Pau Casals i Torrens, Juan Nicolás, Vicenç Rodríguez

Requirements
Subjet 280641

Degree competences to which the subject contributes

Specific:
2. Knowledge of electrical machines and marine electrical systems.

Transversal:
1. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 1. Planning oral communication, answering questions properly and writing straightforward texts that are spelt correctly and are grammatically coherent.

Teaching methodology
Real applications analysis.
Application of theoretical knowledge to the laboratory practices.
Attitude and skills development for power plants operation.
Case studies and articles on the subject.
Perform work individually.

Learning objectives of the subject

- Understanding the basics of electrical machines.
- Understand the schemes and connections of different types of machines and applications.
- Understand the regulatory systems of V, f, P, Q in synchronous generators in island and parallel.
- Having the ability to do calculations and solve problems of electrical machines, using the corresponding equivalent circuits.
- Perform calculations for electrical installations of the ship.
## Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h 30m</th>
<th>Hours large group: 30h 26.67%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 0h 0.00%</td>
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<td></td>
<td>Hours small group: 10h 8.89%</td>
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<td></td>
<td>Guided activities: 5h 4.44%</td>
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<td></td>
<td>Self study: 67h 30m 60.00%</td>
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## Content

<table>
<thead>
<tr>
<th><strong>Synchronous machine</strong></th>
<th><strong>Learning time:</strong> 11h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 7h</td>
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<tr>
<td></td>
<td>Laboratory classes: 4h</td>
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</tbody>
</table>

**Description:**
Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, associated control circuits. Operational and construction in the AC electrical systems and equipment onboard features. Having the basic knowledge for the maintenance of electrical machines and their control systems.

Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment and 7. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4

<table>
<thead>
<tr>
<th><strong>Energy balance</strong></th>
<th><strong>Learning time:</strong> 3h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
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</table>

**Description:**
Having knowledge about the operation of electrical distribution systems, power plant.

<table>
<thead>
<tr>
<th><strong>Asynchronous machine</strong></th>
<th><strong>Learning time:</strong> 8h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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<tr>
<td></td>
<td>Laboratory classes: 6h</td>
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</tbody>
</table>

**Description:**
Having knowledge about the operation of electrical distribution systems, motors and starters, associated control circuits. Operational and construction in the AC electrical systems and equipment onboard features. Having the basic knowledge for the maintenance of electrical machines and their control systems.

Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment and 7. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4
## Start systems

**Learning time:** 4h  
Theory classes: 2h  
Laboratory classes: 2h

### Description:
Having knowledge about the operation of electrical distribution systems, motors and starters, associated control circuits. Operational and construction in the AC electrical systems and equipment onboard features. Having the basic knowledge for the maintenance of electrical machines and their control systems.  
Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment and 7. Maintenance and repair of electrical and electronic equipment. KUPs 7.1 to 7.4

## Static converters

**Learning time:** 4h  
Theory classes: 3h  
Laboratory classes: 1h

### Description:
Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, and start motors. Electronic converters (static), controlled and not controlled, for the regulation of motor speed.  
Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment

## Harmonic and transient

**Learning time:** 2h  
Theory classes: 2h

### Description:
Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, and start motors. Rates of Harmonic Distortion (HD) and Total Harmonic Distortion (THD), for current and voltage.  
Competences in accordance with STCW Code Section A-III/1: 6. Operate electrical, electronic and control systems. KUP 6.1 Electrical equipment
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## Qualification system

During the course there will be evaluations, according to the following percentages:
- Continuous evaluations 30% (Exams Lab., Practices Lab., Expositions, Tasks)
- Partial Exam 40%
- Final Exam 30%

Reevaluation: Test that includes the concepts and objectives set for the final test.

## Regulations for carrying out activities

Attendance and completion of the hands-on labs, is a compulsory requirement.

<table>
<thead>
<tr>
<th>Protocols</th>
<th>Learning time: 4h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 3h</td>
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<tr>
<td></td>
<td>Laboratory classes: 1h</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Description:</th>
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<tbody>
<tr>
<td>Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, motors and starting associated control circuits. Protection and Measuring Equipment.</td>
</tr>
<tr>
<td>Competences in accordance with STCW Code Section A-III/1:</td>
</tr>
<tr>
<td>6. Operate electrical, electronic and control systems. KUPs 6.1 Electrical equipment and</td>
</tr>
<tr>
<td>7. Maintenance and repair of electrical and electronic equipment. KUP 7.1 to 7.4</td>
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<thead>
<tr>
<th>Industrial automation</th>
<th>Learning time: 4h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
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<thead>
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<th>Description:</th>
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</thead>
<tbody>
<tr>
<td>Having knowledge about the operation of electrical distribution systems, generation plant, generators and their synchronization, motors and starting associated control circuits. Automation.</td>
</tr>
<tr>
<td>Competences in accordance with STCW Code Section A-III/1:</td>
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</tr>
<tr>
<td>7. Maintenance and repair of electrical and electronic equipment. KUP 7.1 to 7.4</td>
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</tbody>
</table>
Bibliography

Basic:


Complementary:


Others resources:

**Computer material**

Apunts, articles tècnics i models de simulació aportats pels professor en ATENEA.