280695 - Inspection, Maintenance and Repair of Electric Facilities

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 709 - DEE - Department of Electrical Engineering
Academic year: 2019
Degree: BACHELOR'S Degree in Naval Systems and Technology Engineering (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S Degree in Marine Technologies (Syllabus 2010). (Teaching unit Optional)
BACHELOR'S Degree in Marine Technologies/BACHELOR'S Degree in Naval Systems and Technology Engineering (Syllabus 2016). (Teaching unit Optional)
ECTS credits: 6
Teaching languages: Catalan, Spanish

Teaching staff
Coordinator: VICTOR FUSES NAVARRA
Others: VICTOR FUSES NAVARRA

Opening hours
Timetable: The timetable for personal attention will be published at the beginning of the semester.

Requirements
To register this subject, it must be approved: 280665 Electrical Plant of the Ship, or, 280660 Electric propulsion and power electronics.

Teaching methodology
- Analysis of real applications.
- Receive, understand and synthesize knowledge.
- Define and solve problems.
- Develop the reasoning and critical spirit, and defend it in an oral or written way.

Learning objectives of the subject
- Understand and apply the standards or technical regulations.
- Use the electrical diagrams as an inspection and maintenance tool.
- Know the different types of maintenance that can be applied.
- Apply procedures for early detection of breakdowns
- Knowledge about safety procedures
- Understand the properties of the materials of the electrical installations.
# Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 30h 20.00%</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 15h 10.00%</td>
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<td></td>
<td>Hours small group: 10h 6.67%</td>
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<tr>
<td></td>
<td>Guided activities: 5h 3.33%</td>
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<tr>
<td></td>
<td>Self study: 90h 60.00%</td>
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</tbody>
</table>
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## Content

<table>
<thead>
<tr>
<th>Electric Technical Regulations</th>
<th>Learning time: 8h</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
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</table>

**Description:**

**Related activities:**
Drafting of technical report of deficiencies of a facility based on a selection of standards.

**Specific objectives:**
Use of technical language Identification of deficiencies in a facility.

<table>
<thead>
<tr>
<th>Electrical diagrams as an inspection, maintenance and repair tool</th>
<th>Learning time: 8h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 6h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
</tbody>
</table>

**Description:**
Standardized symbology. Types of schemes. Modification, revision and approval of the electrical diagrams. Examples.

**Related activities:**
Elaboration of the scheme of an installation.

**Specific objectives:**
Interpretation and use of electrical diagrams.

<table>
<thead>
<tr>
<th>Maintenance</th>
<th>Learning time: 8h</th>
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<tbody>
<tr>
<td></td>
<td>Theory classes: 4h</td>
</tr>
<tr>
<td></td>
<td>Practical classes: 2h</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 2h</td>
</tr>
</tbody>
</table>

**Description:**

**Related activities:**
Writing a maintenance plan.
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| **Premature fault detection** | **Learning time:** 6h  
Theory classes: 2h  
Practical classes: 4h |
<table>
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<tr>
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<tbody>
<tr>
<td><strong>Related activities:</strong></td>
<td>Programming of a PLC for automatic recording of periodic voltage and current readings of lead batteries.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Programming of a PLC.</td>
</tr>
</tbody>
</table>

| **Behavior of materials** | **Learning time:** 6h  
Theory classes: 4h  
Practical classes: 2h |
<table>
<thead>
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Study of the behavior of the usual materials of the electrical installations from 5 points of view: electrical, dielectric, magnetic, mechanical and thermal. Types of conductors. High voltage and high current tests.</td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>Participate in the testing of conductors and insulators. Writing a report of the essays.</td>
</tr>
<tr>
<td><strong>Specific objectives:</strong></td>
<td>Acquire skills in the essay of materials. Correct handling of the oscilloscope.</td>
</tr>
</tbody>
</table>

| **Operation in degraded modes** | **Learning time:** 5h  
Practical classes: 5h |
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<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Relationship between the maintenance plan and the emergency plan. Technical limits of engines, generators, installations, protections and materials. Reversible overload and destructive overload.</td>
</tr>
<tr>
<td><strong>Related activities:</strong></td>
<td>Protections test. Report writing.</td>
</tr>
</tbody>
</table>
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## Repairs.

**Description:**
Practical troubleshooting sessions, repair study, and repair.

**Related activities:**
Repair of different devices, equipment ... according to availability.

**Specific objectives:**
Autonomy, critical sense. Use of equemes.

**Learning time:** 10h
- Laboratory classes: 10h

## Safety procedures

**Description:**

**Related activities:**
Study of leakage currents in an installation.

**Learning time:** 9h
- Theory classes: 8h
- Guided activities: 1h

## Planning of activities

### Complete maintenance plan

**Hours:** 20h
- Self study: 20h

**Description:**
Preparation of a complete maintenance plan for a machine or installation of free choice, with temporary, economic, material planning and evaluation criteria for the degree of execution of maintenance. It must include a risk assessment.

**Descriptions of the assignments due and their relation to the assessment:**
Before final exam, the work must be defended orally in class.

**Specific objectives:**
Oral and written expression.
Qualification system

The final grade is the sum of the following partial grades:
\[ N_{\text{final}} = 0.3 \times N_{\text{pf}} + 0.4 \times N_{\text{ac}} + 0.3 \times N_{\text{Le}} \]

\( N_{\text{final}} \): final grade.
\( N_{\text{pf}} \): final evaluation grade.
\( N_{\text{ac}} \): grade for continuous evaluation and directed activities.
\( N_{\text{Le}} \): grade of practical activities / laboratory evaluation.

The continuous evaluation consists of different cumulative activities, both individual and group, of a formative nature, carried out during the course (in the classroom and outside it), exams, work, etc.

Regulations for carrying out activities

- It will be an indispensable requirement to pass the subject, to approve the practical activities / laboratory (\( N_{\text{Le}} > 5 \)).
- If one of the practical activities or continuous assessment is not carried out, it will be considered as not punctuated.
- It will be considered Not submitted: Who has not attended or has a global grade less than 0.5 points.
- In no case, any type of form can be available in the learning controls or tests.
- Only calculators and pens are allowed in exams.
- The use of cell phones in class is not allowed.

Bibliography

Others resources:
- Notes and articles contributed by the teacher
- Regulations of Classification Societies
- Dossiers of manufacturers: Electra Molins, ABB, Siemens, Schneider Electric.