280718 - Thermal Engines

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering
Academic year: 2019
Degree: MASTER'S DEGREE IN THE MANAGEMENT AND OPERATION OF MARINE ENERGY FACILITIES (Syllabus 2016). (Teaching unit Compulsory)
MASTER'S DEGREE IN NAVAL AND OCEAN ENGINEERING (Syllabus 2017). (Teaching unit Optional)
ECTS credits: 5
Teaching languages: Spanish

Teaching staff
Coordinator: MANUEL RODRIGUEZ CASTILLO

Degree competences to which the subject contributes

Basic:
CB10. Students must possess the learning skills that enable them continue studying in a way that will be largely self-directed or autonomous.

Specific:
CE11MEM. Manage the operations of fuel, lubrication and ballast

Generical:
CG8MEM. Acquire a critical independence. Defender of oral and written form their own ideas.

Transversal:
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.

Teaching methodology

Acquire, understand and synthesize knowledge.
And solve problems.
Prepare technical reports.
Adopt solutions in practical cases.
Making memory works.

Learning objectives of the subject

Explain the construction and functional characteristics of marine engines. Analyze the internal behavior of the motors. Provide the knowledge necessary for analysis and diagnosis. Study of performance and power.
This course will evaluate the following STCW A-III/2 competences:
Manage the operation of propulsion plant machinery
Plan and schedule operations
Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery
Manage fuel, lubrication and ballast operations

This knowledge is necessary in accordance with STCW A-III/2 and it's developed according to CHIEF ENGINEER OFFICER AND SECOND ENGINEER OFFICER (Model course 7.02) (2014 Edition)
### Study load

<table>
<thead>
<tr>
<th>Total learning time: 45h</th>
<th>Hours large group:</th>
<th>45h</th>
<th>100.00%</th>
</tr>
</thead>
</table>

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## Content

<table>
<thead>
<tr>
<th>Analysis of power and performance</th>
<th>Learning time: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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</tbody>
</table>

**Description:**
Description of the design features and working mechanisms of the main engines and auxiliary machinery.

<table>
<thead>
<tr>
<th>Energy load</th>
<th>Learning time: 2h</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
</tbody>
</table>

**Description:**
Description of the systems and the propulsion characteristics of diesel engines, including the speed, power and fuel consumption. Analysis of the operating limits of the propulsion installation.

**Specific objectives:**
- Manage the operation of propulsion plant machinery
- Design features, and operative mechanism of marine diesel engines and associated auxiliaries.

<table>
<thead>
<tr>
<th>Optimization and control</th>
<th>Learning time: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
</tbody>
</table>

**Description:**
Functions and mechanisms of automatic control of the main motor. Operation and operation of main propulsion and auxiliary machinery, including associated systems.

**Specific objectives:**
- Plan and schedule operations
- Thermodynamics and heat transfer
- Mechanics and hydromechanics
- Propulsive characteristics of diesel engines, including speed, power and fuel consumption
- Thermal cycle, thermal efficiency and thermal balance of marine diesel engine
- Physical and chemical properties of fuels and lubricants

<table>
<thead>
<tr>
<th>Electronic injection</th>
<th>Learning time: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
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</tbody>
</table>

**Description:**
Functions and requirements of the injection devices. Functions and mechanisms of automatic control of the main motor.
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<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Supercharger</strong></td>
<td>2h</td>
<td>Utility and boost modes. Supercharger of large two-stroke engines. Two-stage supercharging engines and low compression ratio.</td>
</tr>
<tr>
<td><strong>Rotary engines</strong></td>
<td>2h</td>
<td>Rotary engines, types and alternative fuels. Operating Principles: Wankel, Radmax, Quasiturbine, Round Engine, etc.</td>
</tr>
<tr>
<td><strong>Diagram Interpretation</strong></td>
<td>1h</td>
<td>Obtaining, interpreting and analyzing diagrams. Analysis of the heat cycle, thermal efficiency and thermal balance of the motor.</td>
</tr>
</tbody>
</table>
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**Operation, faults and repairs**

<table>
<thead>
<tr>
<th><strong>Description:</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspection, diagnosis and failure analysis of diesel engines.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><strong>Specific objectives:</strong></th>
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</thead>
<tbody>
<tr>
<td>Operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery</td>
</tr>
<tr>
<td>Start up and shut down main propulsion and auxiliary machinery, including associated systems</td>
</tr>
<tr>
<td>Operating limits of propulsion plant</td>
</tr>
<tr>
<td>The efficient operation, surveillance, performance assessment and maintaining safety of propulsion plant and auxiliary machinery</td>
</tr>
<tr>
<td>Manage fuel, lubrication and ballast operations</td>
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<tr>
<td>Operation and maintenance of machinery, including pumps and piping systems</td>
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<table>
<thead>
<tr>
<th><strong>Learning time:</strong></th>
</tr>
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<tbody>
<tr>
<td><strong>Theory classes:</strong> 1h</td>
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**Qualification system**

The final score is the sum of the following partial grades:

\[ N_{final} = 0.6 \times N_{pf} + 0.4 \times N_{ec} \]

- **N_final**: Final Rating
- **N_pf**: Rated final test
- **N_ec**: Course exercises and workshop practices

The final test consists of a part with issues related to the learning objectives of the course in terms of knowledge or understanding concepts, and a set of application exercises. Continuous assessment consists of various tests and formative activities, both individual and group, made during the course.

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**Regulations for carrying out activities**

If you have not done laboratory activities, work or evaluation, is considered as punctuated. It is considered not submitted when not perform any of the tests.
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Bibliography

Basic:


Complementary:


