280668 - Naval Engines

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering
Academic year: 2019
Degree: BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 9 Teaching languages: Spanish

Teaching staff
Coordinator: MANUEL RODRIGUEZ CASTILLO
Others: Primer quadrimestre:
GERMAN DE MELO RODRIGUEZ - 1
IGNACIO ECHEVARRIETA SAZATORNIL - 1
MANUEL RODRIGUEZ CASTILLO - 1

Degree competences to which the subject contributes

Specific:
1. Knowledge of marine diesel engines, gas turbines and steam plants.

General:
2. ABILITY TO SHAPE, DESIGN AND IMPLEMENT COMPLEX SYSTEMS IN THE FIELD OF NAVAL ENGINEERING. Ability to conception, design and implementation of processes, systems and / or services in the field of naval technical engineering, including the drafting and development of projects in the field of specialization, knowledge of basic materials and technologies, decision making, managing the activities being projects within their specialty, conducting measurements, calculations and valuations, managing specifications, regulations and mandatory standards, assessment of the social and environmental impact of technical solutions adopted, economic, material and human resources involved in the project, with a systematic and comprehensive vision assessment.
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**Teaching methodology**

Internal Combustion Engines

- Acquire, understand and synthesize knowledge.
- And solve problems.
- Prepare technical reports.
- Adopt solutions in practical cases.
- Perform the memory of a lab or work.
- Analyze results.
- Relate knowledge from different disciplines.
- Develop critical thinking and reasoning and defend it orally or in writing.

Steam and gas turbines

- Ability to learn new methods and theories to equip themselves with the versatility to adapt to new situations.
- Ability to solve problems with initiative, decision making, creativity, and critical thinking skills to communicate and transmit knowledge and skills.
- Ability to carry out inspections, measurements, evaluations, appraisals, surveys, studies, reports, work plans and on site certifications steam turbine and gas.
- Ability to analyze and assess the social and environmental impact of technical solutions.
- Ability to design and planning of marine facilities for gas and steam turbines.

Steam generators

- Acquire, understand and synthesize knowledge.
- And solve problems.
- Prepare technical reports.
- Adopt solutions in practical cases.
- Perform the memory of a lab or work.
- Analyze results.
- Relate knowledge from different disciplines.
- Develop critical thinking and reasoning and defend it orally or in writing.

**Learning objectives of the subject**

Internal Combustion Engines (MCI)

- Theoretical and practical understanding of the operation of internal combustion engines.
- Knowledge of various types and facilities on board. Marine engines.
- Knowledge of computing powers, jobs, income, consumption, etc..
- Use and apply the knowledge gained in the design and selection of marine diesel engines.

Steam and gas turbines (TVG)

- Cognitive analysis and understanding of the work cycles of steam turbines and gas.
- Knowledge of the different parts of a steam turbine and gas.
- Knowledge of calculating speeds triangles tobero pallets and pallets.
- Knowledge of the calculation of the Powers, jobs, income, etc..
- Understanding various types of turbines and their installation on board.
- Using the knowledge gained to design and dimensioning of the turbines.

Steam generators (GV)
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In-depth knowledge of the steam generators.
Use and apply knowledge gained in the design and selection of steam generators.

<table>
<thead>
<tr>
<th>Study load</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Total learning time:</strong> 225h</td>
<td></td>
</tr>
<tr>
<td>Hours large group: 60h</td>
<td>26.67%</td>
</tr>
<tr>
<td>Hours medium group: 25h</td>
<td>11.11%</td>
</tr>
<tr>
<td>Hours small group: 5h</td>
<td>2.22%</td>
</tr>
<tr>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td>Self study: 135h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
### Content

<table>
<thead>
<tr>
<th>Topic</th>
<th>Learning time:</th>
<th>Description:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Application and classification of internal combustion engines (MCI).</td>
<td>2h</td>
<td>Study on the different applications of internal combustion engines and ranking.</td>
</tr>
<tr>
<td><strong>Fundamental concepts and general definitions of MCI.</strong></td>
<td>2h</td>
<td>Schematic and nomenclature of the reciprocating engine. The engine ignition. The compression ignition engine. Differences between MECh and MEC. Working fluid.</td>
</tr>
<tr>
<td><strong>Engine operating cycles two and four times.</strong></td>
<td>2h</td>
<td>Indicated cycle and mean pressure indicated. Differences between actual and theoretical cycles. Study diagram indicated. Pressure diagram.</td>
</tr>
<tr>
<td>Topic</td>
<td>Learning time: 2h</td>
<td></td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
<td>-------------------</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Theory classes: 2h</td>
<td></td>
</tr>
</tbody>
</table>

**Calculation of powers, yields and consumptions.**

**Description:**
Indicated power. Effective power. Power absorbed by passive resistance. Mean effective pressure. Yields.

**Engine performance and factors that influence it.**

**Description:**

**Combustion and Fuels.**

**Description:**

**Lubrication.**

**Description:**

**Forming the mixture.**

**Description:**
<table>
<thead>
<tr>
<th>Component</th>
<th>Learning time: 2h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 2h</td>
</tr>
</tbody>
</table>

### Refrigeration.

**Description:**
Refrigerants. Systems and cooling elements.

### Scavenging

**Description:**

### Motor starting.

**Description:**
Systems and startup items. Reversible motors.

### Supercharger.

**Description:**
Supercharging systems and components.

### Rotary engines.

**Description:**

(ENG) **Cicles de treball de les turbines de vapor.**
### Degree competences to which the content contributes:

<table>
<thead>
<tr>
<th>ENG Classificació de les turbines.</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENG Parts de les turbines: paletes, toveres, directrius i tobero-paletes.</td>
</tr>
<tr>
<td>ENG Estudi dinàmic de les turbines de flux axial i radial.</td>
</tr>
<tr>
<td>ENG Estudi de les turbines d’acció.</td>
</tr>
<tr>
<td>ENG (CAST) Estudio de las turbinas de reacción.</td>
</tr>
<tr>
<td>ENG Estators de les turbines.</td>
</tr>
<tr>
<td>ENG Rotors de les turbines.</td>
</tr>
<tr>
<td>ENG Paletes o àleps de les turbines.</td>
</tr>
<tr>
<td>ENG Regulació de la potència de les turbines de vapor.</td>
</tr>
<tr>
<td>Topic</td>
</tr>
<tr>
<td>----------------------------------------------------------------------</td>
</tr>
<tr>
<td>(ENG) Condensadors.</td>
</tr>
<tr>
<td>(ENG) Instal · lacions de vapor.</td>
</tr>
<tr>
<td>(ENG) Cicles de treball de les turbines de gas.</td>
</tr>
<tr>
<td>(ENG) Parts d'un grup motor de turbines de gas: compressor, cambra de combustió i turbina.</td>
</tr>
<tr>
<td>(ENG) Combustió i combustibles de les turbines de gas.</td>
</tr>
<tr>
<td>(ENG) Cicles combinats.</td>
</tr>
<tr>
<td>(ENG) Tipus de generadors de vapor i parts que els componen.</td>
</tr>
<tr>
<td>(ENG) Accessoris de calderes.</td>
</tr>
<tr>
<td>(ENG) Combustibles utilitzats en generadors de vapor.</td>
</tr>
</tbody>
</table>
Degree competences to which the content contributes:

(ENG) Combustió.

Degree competences to which the content contributes:

(ENG) Cremadors.

Degree competences to which the content contributes:

(ENG) Emissió de contaminants i la seva eliminació.

Degree competences to which the content contributes:

(ENG) Anàlisi i tractament d'aigües.

Degree competences to which the content contributes:

(ENG) Balanç tèrmic i rendiment de generadors de vapor.

Degree competences to which the content contributes:

(ENG) Càlcul tèrmic i hidràulic.

Degree competences to which the content contributes:

Qualification system

N\text{final Subject} = 0.33 \ N\text{final MCI} + 0.33 \ N\text{final TVG} + 0.33 \ N\text{final GV}

A final test of reevaluation students who meet the requirements of the regulations will be made center, consisting of a single test in which all of the matter that will be assessed during the course.

Regulations for carrying out activities

If you have not done laboratory activities, work or evaluation, is considered not scored.

It is considered not submitted when not perform any tests.
Bibliography

Basic:


Complementary:


Pérez del Río, José. Tratado general de máquinas marinas. 2a ed corregida y ampliada. Barcelona: Planeta, 1967-.

Stodola, A. Turbines à vapeur et à gaz. 2ème ed. Paris: Dunod, 1925.


