Degree competences to which the subject contributes

Specific:
1. Ability to design and manage energy optimization systems applied to marine installations.
2. Knowledge of the fundamentals of Fluid Mechanics machines and systems, internal combustion engines, steam turbines and gas, steam generators, cooling and air conditioning.

Teaching methodology
Teaching method is class work with the possibility of individual or grupal work and its presentation, practical exercises and individual work with the material in ATENEA.

Learning objectives of the subject

Steam generators
Achieve, understand and synthesise knowledge
Lay out and solve problems
Develop technical reports.
Take solutions for practical cases.
Develop the memory of a workshop or laboratory practice
Analyse results
Relate and connect knowledges of different subjects
Develop reasoning and critical ability and defend it in oral and written form

Show knowledge about the working, calculation and appliances in marine systems of steam and gas turbines and steam generators.
Ability of design and manage energetic optimization of marine steam installations.
Knowledge of the concept of life cycle of a product and apply to development of products and services in the marine engineering, using the proper legislation
Ability of planning and using the information for a project or academical work over a critical reflection about the information resources used.

This course will evaluate the following STCW competences:

4. Operate main and auxiliary machinery and associated control systems
280654 - Marine Turbomachines and Steam Generators

7. Maintenance and repair of electrical and electronic equipment
9. Maintenance and repair of shipboard machinery and equipment

<table>
<thead>
<tr>
<th>Study load</th>
<th>Hours large group:</th>
<th>70h</th>
<th>31.11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total learning time:</td>
<td>Hours medium group:</td>
<td>20h</td>
<td>8.89%</td>
</tr>
<tr>
<td></td>
<td>Hours small group:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Guided activities:</td>
<td>0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>135h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
# 280654 - Marine Turbomachines and Steam Generators

## Content

<table>
<thead>
<tr>
<th>ENG Content</th>
<th>Degree competences to which the content contributes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ciclos de trabajo de las turbinas de vapor.</td>
<td></td>
</tr>
<tr>
<td>Clasificación de las turbinas.</td>
<td></td>
</tr>
<tr>
<td>Partes de las turbinas: paletas, toberas, directrices y tobero-paletas.</td>
<td></td>
</tr>
<tr>
<td>Estudio dinámico de las turbinas de flujo axial y radial.</td>
<td></td>
</tr>
<tr>
<td>studio de las turbinas de acción.</td>
<td></td>
</tr>
<tr>
<td>Estudio de las turbinas de reacción.</td>
<td></td>
</tr>
<tr>
<td>Estatores de las turbinas.</td>
<td></td>
</tr>
<tr>
<td>Rotores de las turbinas.</td>
<td></td>
</tr>
<tr>
<td>Paletas o álabes de las turbinas.</td>
<td></td>
</tr>
</tbody>
</table>
### Regulación de la potencia de las turbinas de vapor.

**Degree competences to which the content contributes:**

### Condensadores.

**Degree competences to which the content contributes:**

| Learning time: | 1h |
| Theory classes: | 1h |

**Description:**

### Ciclos de trabajo de las turbinas de gas.

**Degree competences to which the content contributes:**

### Partes de un grupo motor de turbinas de gas: compresor, cámara de combustión y turbina.

**Degree competences to which the content contributes:**

### Combustión y combustibles de las turbinas de gas.

**Degree competences to which the content contributes:**

### Ciclos combinados.

**Degree competences to which the content contributes:**

| Learning time: | 5h |
| Theory classes: | 5h |

**Types of Steam generators.**

| Description: |
| Types of Steam generators. Parts of steam generators |
## Boiler mountings

**Description:**

**Learning time:** 5h  
Theory classes: 5h

## Fuels used in steam generators

**Description:**
Fuels used in steam generators. Solid, liquid, gas fuels.

**Learning time:** 5h  
Theory classes: 5h

## Combustion

**Description:**

**Learning time:** 5h  
Theory classes: 5h

## Burners

**Description:**
Burners for solid fuels: Travelling Stokers, Pulverised coal, Fluidised bed  
Burners for liquid fuels  
Burners for gas. Pressure reduction equipment.

**Learning time:** 5h  
Theory classes: 5h

## Pollution emission and its reduction.

**Description:**
NOx. Means to avoid its formation. Ways to its elimination  
SOx. Elimination  
Other pollutants

**Learning time:** 5h  
Theory classes: 5h
### Water analysis and treatment

**Description:**

**Learning time:** 5h
- Theory classes: 5h

### Thermal balance and efficiency of steam generators.

**Description:**
Thermal balance: Direct and indirect methods.

**Learning time:** 5h
- Theory classes: 5h

### Operation and maintenance of steam generators.

**Description:**
Boiler starting, connecting, putting out of service, basic typical actions of operation and maintenance.

**Learning time:** 5h
- Theory classes: 5h

### Qualification system

\[ N_{\text{final}} = 0.5N_{\text{final TVG}} + N_{\text{final GV}} \]
\[ N_{\text{final TVG}} = 0.6 \ N_{pf} + 0.2 \ N_{ec} + 0.2 \ N_{elt} \]
\[ N_{\text{final GV}} = 0.6 \ N_{pf} + 0.2 \ N_{ec} + 0.2 \ N_{elt} \]

- \( N_{\text{final}} \): final qualification.
- \( N_{pf} \): final exam qualification.
- \( N_{ec} \): continuous assessment qualification.
- \( N_{elt} \): laboratory and works qualification.

### Regulations for carrying out activities

If none of the exams is made, the qualification will be not presented.
Bibliography

Basic:


Stodola, A. Turbinas a vapor et a gaz. Paris: Dunod, 1925.


