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.

Learning objectives of the subject

Cognitive and comprehensive analysis of the work cycles of steam and gas turbines
Knowledge of the different parts that make up a steam and gas turbine.
Knowledge of the calculation of the triangles of speeds of the blades and nozzels-blades.
Knowledge of the calculation of powers, works, efficiency, etc.
Knowledge of the different types of turbines and their installation on board.
Use of the knowledge acquired for the design and dimensioning of the turbines.
Know the fundamentals of fluidomechanical systems and machines.
Demonstrates knowledge of the operation, calculation and applications in marine systems of steam and gas turbines and steam generators.
It is capable of designing and managing energy optimization systems applied to marine facilities.
Know the concept of a product's life cycle and apply it to the development of products and services in the field of marine engineering, using the appropriate regulations and legislation.
Plan and use the necessary information for a project or academic work based on a critical reflection on the information resources used.
This course will evaluate the following STCW competences:

4. Operate main and auxiliary machinery and associated control systems
7. Maintenance and repair of electrical and electronic equipment
9. Maintenance and repair of shipboard machinery and equipment

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

### Study load

<table>
<thead>
<tr>
<th>Total learning time: 225h</th>
<th>Hours large group:</th>
<th>70h</th>
<th>31.11%</th>
</tr>
</thead>
<tbody>
<tr>
<td></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>
Content

(ENG) Ciclos de trabajo de las turbinas de vapor.
Degree competences to which the content contributes:

(ENG) Clasificación de las turbinas.
Degree competences to which the content contributes:

(ENG) Partes de las turbinas: paletas, toberas, directrices y tobero-paletas.
Degree competences to which the content contributes:

(ENG) Estudio dinámico de las turbinas de flujo axial y radial.
Degree competences to which the content contributes:

(ENG) estudio de las turbinas de acción.
Degree competences to which the content contributes:

(ENG) Estudio de las turbinas de reacción.
Degree competences to which the content contributes:

(ENG) Estatores de las turbinas.
Degree competences to which the content contributes:

(ENG) Rotores de las turbinas.
Degree competences to which the content contributes:

(ENG) Paletas o álabes de las turbinas.
Degree competences to which the content contributes:
### Regulación de la potencia de las turbinas de vapor

Degree competences to which the content contributes:

```
<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 1h</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Theory classes: 1h</td>
</tr>
</tbody>
</table>
```

### Condensadores

Degree competences to which the content contributes:

### 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:

### Types of Steam generators

#### Learning time: 1h
Theory classes: 1h

#### 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

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alcaline treatment. Degasification. Ion exchange. Other treatments. Typical water analysis in the ships.</td>
<td>Theory classes: 5h</td>
</tr>
</tbody>
</table>

### Thermal balance and efficiency of steam generators.

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermal balance: Direct and indirect methods.</td>
<td>Theory classes: 5h</td>
</tr>
</tbody>
</table>

### Operation and maintenance of steam generators.

<table>
<thead>
<tr>
<th>Description:</th>
<th>Learning time: 5h</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiler starting, connecting, putting out of service, basic typical actions of operation and maintenance</td>
<td>Theory classes: 5h</td>
</tr>
</tbody>
</table>

### Qualification system

\[ N_{final} = 0.5N_{finalTVG} + N_{finalGV} \]
\[ N_{finalTVG} = 0.7 \ N_{pf} + 0.3 \ N_{ec} \]
\[ N_{finalGV} = 0.7 \ N_{pf} + 0.3 \ N_{ec} \]

\( N_{final} \): 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.
280654 - Marine Turbomachines and Steam Generators

Bibliography

Basic:


