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 group 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
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: 70h 31.11%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 20h 8.89%</td>
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<tr>
<td></td>
<td>Hours small group: 0h 0.00%</td>
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<tr>
<td></td>
<td>Guided activities: 0h 0.00%</td>
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<tr>
<td></td>
<td>Self study: 135h 60.00%</td>
</tr>
<tr>
<td>Content</td>
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<tr>
<td>(ENG) Ciclos de trabajo de las turbinas de vapor.</td>
<td></td>
</tr>
<tr>
<td>Degree competences to which the content contributes:</td>
<td></td>
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<tr>
<td>(ENG) Clasificación de las turbinas.</td>
<td></td>
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<tr>
<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) Partes de las turbinas: paletas, toberas, directrices y tobero-paletas.</td>
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<tr>
<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) Estudio dinámico de las turbinas de flujo axial y radial.</td>
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<tr>
<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) estudio de las turbinas de acción.</td>
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<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) Estudio de las turbinas de reacción.</td>
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<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) Estatores de las turbinas.</td>
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<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) Rotores de las turbinas.</td>
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<tr>
<td>Degree competences to which the content contributes:</td>
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<tr>
<td>(ENG) Paletas o álapes de las turbinas.</td>
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<tr>
<td>Degree competences to which the content contributes:</td>
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</tbody>
</table>
### Types of Steam generators.

| **Description:** | **Learning time:** 5h  
Theory classes: 5h |
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Types of Steam generators. Parts of steam generators</td>
<td></td>
</tr>
</tbody>
</table>
### Boiler mountings

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

**Description:**
- Boiler mountings
- Safety valves
- Level indicators
- Level sensors
- Soot blowers

---

### Fuels used in steam generators

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

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

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### Combustion

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

**Description:**
- Combustion
- Required air
- Produced gases
- Air excess
- Combustion diagnose

---

### Burners

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

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

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### Pollution emission and its reduction

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

**Description:**
- NOx: Means to avoid its formation. Ways to its elimination
- SOx: Elimination
- Other pollutants
### 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_{final} = 0.5N_{final\ TVG} + N_{final\ GV}
N_{final\ TVG} = 0.7 \ N_{pf} + 0.3 \ N_{ec}
N_{final\ GV} = 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.
Bibliography

Basic:


