280640 - Applied Thermodynamics and Thermotechnics

Coordinating unit: 280 - FNB - Barcelona School of Nautical Studies
Teaching unit: 742 - CEN - Department of Nautical Sciences and Engineering
Academic year: 2017
Degree: BACHELOR'S DEGREE IN MARINE TECHNOLOGIES/BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2016). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN NAVAL SYSTEMS AND TECHNOLOGY ENGINEERING (Syllabus 2010). (Teaching unit Compulsory)
BACHELOR'S DEGREE IN MARINE TECHNOLOGIES (Syllabus 2010). (Teaching unit Compulsory)
ECTS credits: 6
Teaching languages: Spanish

Teaching staff
Coordinator: SERGIO IVÁN VELASQUEZ CORREA
Others: SERGIO IVÁN VELASQUEZ CORREA - 1

Degree competences to which the subject contributes

Specific:
2. Knowledge of applied thermodynamics and heat transfer.
3. Applied knowledge of thermodynamics and heat transfer.

Transversal:
1. THIRD LANGUAGE. Learning a third language, preferably English, to a degree of oral and written fluency that fits in with the future needs of the graduates of each course.

Learning objectives of the subject

Study load

<table>
<thead>
<tr>
<th>Total learning time: 150h</th>
<th>Hours large group: 30h</th>
<th>20.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours medium group: 28h</td>
<td>18.67%</td>
</tr>
<tr>
<td></td>
<td>Hours small group: 2h</td>
<td>1.33%</td>
</tr>
<tr>
<td></td>
<td>Guided activities: 0h</td>
<td>0.00%</td>
</tr>
<tr>
<td></td>
<td>Self study: 90h</td>
<td>60.00%</td>
</tr>
</tbody>
</table>
## Content

| (ENG) Heat Transfer | Learning time: 6h  
Practical classes: 2h  
Self study : 4h |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Description:</strong></td>
<td>Definition and mechanisms. Energy conservation principle</td>
</tr>
</tbody>
</table>

| (ENG) (CAST) Conducción. | Learning time: 29h  
Theory classes: 5h  
Practical classes: 7h  
Self study : 17h |
|-------------------------|-------------------|

| (ENG) Convección | Learning time: 3h  
Theory classes: 1h  
Self study : 2h |
|------------------|-------------------|

| (ENG) Radiación | Learning time: 18h  
Theory classes: 4h  
Guided activities: 4h  
Self study : 10h |
|-----------------|-------------------|

| Heat Exchangers | Learning time: 10h  
Theory classes: 1h  
Guided activities: 2h  
Self study : 7h |
|-----------------|-------------------|

**Description:**
A heat exchanger is a device for transferring heat energy from a fluid or substance at higher temperature to one of lower. The purpose of these devices is to prepare a substance or quantity of matter for various purposes, entrance to a process, an environment conditioning, heat removal systems that should remain at a constant temperature, evaporate or condense substances, etc.
<table>
<thead>
<tr>
<th>Concept</th>
<th>Learning time</th>
<th>Theory classes</th>
<th>Guided activities</th>
<th>Self study</th>
</tr>
</thead>
<tbody>
<tr>
<td>(ENG) Conceptos básicos de Termodinamica</td>
<td>4h</td>
<td>1h</td>
<td></td>
<td>3h</td>
</tr>
<tr>
<td>(ENG) Propiedades de las sustancias puras</td>
<td>3h</td>
<td>1h</td>
<td></td>
<td>2h</td>
</tr>
<tr>
<td>(ENG) Análisis de energía en sistemas cerrados</td>
<td>10h</td>
<td>1h</td>
<td>2h</td>
<td>7h</td>
</tr>
<tr>
<td>(ENG) Análisis de masa y energía en volúmenes de control</td>
<td>14h</td>
<td>2h</td>
<td>4h</td>
<td>8h</td>
</tr>
<tr>
<td>(ENG) Segunda ley de la Termodinámica</td>
<td>19h</td>
<td>3h</td>
<td>5h</td>
<td>11h</td>
</tr>
<tr>
<td>(ENG) Entropia</td>
<td>20h</td>
<td>4h</td>
<td>5h</td>
<td>11h</td>
</tr>
</tbody>
</table>
Power cycles

Learning time: 12h
Theory classes: 1h
Guided activities: 3h
Self study : 8h

Description:
Power cycles are cycles which convert some heat input into a mechanical work output. Thermodynamic power cycles are the basis for the operation of heat engines, which supply most of the world’s electric power and run the vast majority of motor vehicles. Power cycles can be organized into two categories: real cycles and ideal cycles. Cycles encountered in real world devices (real cycles) are difficult to analyze because of the presence of complicating effects (friction). Some cycles to be studied are:
- Carnot
- Rankine
- Refrigeration
- Stirling
- Brayton
- Diesel
- Otto

Qualification system

The final grade of the subject is the result from summing the partial evaluations as follows:

\[ N_{\text{final}} = 0.5 \times N_{\text{pf}} + 0.3 \times N_{\text{pp}} + 0.20 \times N_{\text{ac}} \]

Nfinal: Final grade
Npf: Final exam grade
Npp: Partial exam grade
Nac: Continuous evaluation process (quizes, homeworks, etc.)
280640 - Applied Thermodynamics and Thermotechnics

Bibliography

Basic:


Complementary:


