240IEN34 - Thermal Equipment Design

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 724 - MMT - Department of Heat Engines
Academic year: 2017
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 4,5 Teaching languages: Catalan

Teaching staff
Coordinator: Lluís Albert Bonals Muntada
Others: Enrique Velo Garcia

Opening hours
Timetable: All queries are arranged via email.

Prior skills
Thermotechnology
Thermodynamics and Fluid Mechanics
Basic Informatics

Teaching methodology
Classes combine theory and problems, inviting students to participate actively in them, case analysis and technical decision-making. Continued work is encouraged throughout the course with the proposal and delivery of problems and equipment design exercises.

Learning objectives of the subject

SPECIFIC GOAL
1) To know the main types and particularities of industrial equipment in which there is generation, supply and/or recovery of thermal energy.
2) Know how to size such equipment or determine its performance from:
a) Obtaining more or less complex models for approaching matter and energy balances and the heat and/or mass transfer equations.
b) The application of simplified methods for calculating specific thermal equipment.
All this through the application of analytical and numerical calculation techniques and the use of modern calculation tools.

Study load

<table>
<thead>
<tr>
<th>Total learning time: 112h</th>
<th>Hours large group:</th>
<th>27h</th>
<th>24.11%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group:</td>
<td>13h</td>
<td></td>
<td>11.61%</td>
</tr>
<tr>
<td>Self study:</td>
<td>72h</td>
<td></td>
<td>64.29%</td>
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</tbody>
</table>
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## Content

<table>
<thead>
<tr>
<th>Section</th>
<th>Learning time:</th>
<th>Practical classes:</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>INTRODUCTION</strong></td>
<td>1h 30m</td>
<td>1h 30m</td>
</tr>
<tr>
<td><strong>CONVECTION WITHOUT PHASE CHANGE</strong></td>
<td>4h 30m</td>
<td>4h 30m</td>
</tr>
<tr>
<td><strong>INTRODUCTION TO HEAT EXCHANGERS.</strong></td>
<td>6h</td>
<td>6h</td>
</tr>
<tr>
<td><strong>CONVECTION WITH PHASE CHANGE</strong></td>
<td>10h 30m</td>
<td>10h 30m</td>
</tr>
<tr>
<td><strong>SHELL AND TUBE EXCHANGERS</strong></td>
<td>12h 30m</td>
<td>12h 30m</td>
</tr>
</tbody>
</table>

### INTRODUCTION

**Description:**
Presentation of the subject. Introduction to heat exchanger.

### CONVECTION WITHOUT PHASE CHANGE

**Description:**

### INTRODUCTION TO HEAT EXCHANGERS.

**Description:**

### CONVECTION WITH PHASE CHANGE

**Description:**

### SHELL AND TUBE EXCHANGERS

**Description:**
The student’s grade will be: \( N_{\text{final}} = 0.40 \times N_{\text{parcial}} + 0.40 \times N_{\text{final}} + 0.20 \times N_{\text{prob}} \)

- \( N_{\text{final}} \): final note
- \( N_{\text{parcial}} \): note test or partial tests
- \( N_{\text{final}} \): final exam note
- \( N_{\text{prob}} \): note problems and design exercises delivered

Continuous assessment

The problems and design exercises proposed by the teachers to do at home, are essential by double entry, help the final grade and obviously achieve the final exam in better conditions.

Only with the objective of improving the grade, the faculty reserves the possibility of incorporating, if necessary, other elements or evaluation criteria.

Qualification system

Midterm exam

This is a test done in class schedule, which evaluates the content exposed in the first weeks. You have to carry a programmable calculator and only one handwritten form is allowed on an A4 sheet on both sides. The student who, due to justified reasons, can not present himself to a test, must communicate it to the Studies Department (Ordenació d’Estudis) with the corresponding supporting documents and give advance notice to the coordinator.

The final exam will consist of:

* A theory test (without form) with conceptual questions and / or small exercises.
* Resolution of a problem (with form). (Written exercise).
* Maximum duration of the exam: 4 h (there is programmable calculator and DNI).
Bibliography

Basic:

Complementary:

Others resources:
Audiovisual and computer equipment
- Files in MS Powerpoint with transparencies about the theme of the course.
- Files in MS Excel with some exercises solved.
- Digital Campus ATENEA
- Collection of problems.