240IEN34 - Thermal Equipment Design

Coordinating unit: 240 - ETSEIB - Barcelona School of Industrial Engineering
Teaching unit: 724 - MMT - Department of Heat Engines
Academic year: 2019
Degree: MASTER'S DEGREE IN INDUSTRIAL ENGINEERING (Syllabus 2014). (Teaching unit Optional)
ECTS credits: 4,5
Teaching languages: Catalan

Teaching staff

Coordinator: Velo Garcia, Enrique
Others: Enrique Velo Garcia
Bonal Muntada, Lluis Albert

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.

During the spring semester of the 2019-2020 academic year, and because of the health crisis due to Covid19, the face-to-face classes are canceled from March 13 until the end or the semester. During this period, teaching is carried out through online activities on the ATENeA campus.

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 30m</th>
<th>Hours medium group:</th>
<th>27h</th>
<th>24.00%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Hours small group:</td>
<td>13h 30m</td>
<td>12.00%</td>
</tr>
<tr>
<td></td>
<td>Self study:</td>
<td>72h</td>
<td>64.00%</td>
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</tbody>
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## Content

### INTRODUCTION

**Learning time:** 1h 30m  
Practical classes: 1h 30m

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

### CONVECTION WITHOUT PHASE CHANGE

**Learning time:** 4h 30m  
Practical classes: 4h 30m

**Description:**  

### INTRODUCTION TO HEAT EXCHANGERS.

**Learning time:** 6h  
Practical classes: 6h

**Description:**  

### CONVECTION WITH PHASE CHANGE

**Learning time:** 10h 30m  
Practical classes: 10h 30m

**Description:**  

### SHELL AND TUBE EXCHANGERS

**Learning time:** 12h 30m  
Laboratory classes: 12h 30m

**Description:**  
Qualification system

The student's grade will be: \( N_{\text{final}} = 0.40 \ N_{\text{parcial}} + 0.40 \ N_{\text{exfinal}} + 0.20 \ N_{\text{prob}} \)

- \( N_{\text{final}} \): final note
- \( N_{\text{parcial}} \): note test or partial tests
- \( N_{\text{exfinal}} \): 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.

During the spring semester of the 2019-2020 academic year, despite the health crisis due to Covid19, the qualification system remains unchanged. However, both the mid-term test and the final exam will be carried out using remote connection tools and tools from the ATENEA campus.

Regulations for carrying out activities

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).

During the spring semester of the 2019-2020 academic year, and because of the health crisis due to Covid19, this topic is excluded from the course's agenda.
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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.