Course guide
820325 - GETF - Thermal and Fluid Dynamic Power Generation

Unit in charge: Barcelona East School of Engineering
Teaching unit: 729 - MF - Department of Fluid Mechanics.
Degree: BACHELOR'S DEGREE IN ENERGY ENGINEERING (Syllabus 2009). (Compulsory subject).
Academic year: 2023 ECTS Credits: 6.0 Languages: Catalan

LECTURER
Coordinating lecturer: JOAN GRAU BARCELÓ
Others:
Primer quadrimestre:
ALFRED FONTANALS GARCIA - Grup: M13
JUAN GRAU BARCELÓ - Grup: M11, Grup: M12, Grup: M13
JAN MATEU ARMENGOL - Grup: M11, Grup: M12

Segon quadrimestre:
JOSE ALEJANDRO CARRILLO CORTES - Grup: T13
JUAN GRAU BARCELÓ - Grup: T11, Grup: T12, Grup: T13
PEDRO RUFES MARTINEZ - Grup: T11, Grup: T12
MARIO MIGUEL VALERO PÉREZ - Grup: T11, Grup: T12, Grup: T13

REQUIREMENTS
MECÀNICA DE FLUIDS - Prerequisit
TERMODINÀMICA I TRANSFERÈNCIA DE CALOR - Precorequisit

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES
Specific:
CEENE-190. (ENG) Analizar los principios de operación de centrales termofluidodinámicas.
CEENE-13. Analyse the principles of operation of generators and boilers.

Transversal:
3. EFFICIENT ORAL AND WRITTEN COMMUNICATION - Level 2. Using strategies for preparing and giving oral presentations. Writing texts and documents whose content is coherent, well structured and free of spelling and grammatical errors.

TEACHING METHODOLOGY
The course content will develop a methodology and participatory exhibits when taught the theoretical content. Students will work individually to make the understanding, analysis and synthesis of theory. In addition, teamwork will be necessary to address complex problems (theoretical and laboratory).

LEARNING OBJECTIVES OF THE SUBJECT
To know the operation and the dimensioning of heat engines and hydraulic and heat transfer equipment commonly used in industry.
### STUDY LOAD

<table>
<thead>
<tr>
<th>Type</th>
<th>Hours</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hours small group</td>
<td>15.0</td>
<td>10.00</td>
</tr>
<tr>
<td>Hours large group</td>
<td>45.0</td>
<td>30.00</td>
</tr>
<tr>
<td>Self study</td>
<td>90.0</td>
<td>60.00</td>
</tr>
</tbody>
</table>

Total learning time: 150 h

### CONTENTS

**1. Thermal generation: Combustion. Steam boilers. Solar thermal energy applications.**

**Description:**

**Specific objectives:**
After completing this section, the student will recognize different heat generation systems, including the use of fuels and solar radiation in thermal systems. The student will also be able to perform basic design tasks for heat generation systems.

**Related activities:**
Laboratory: Solar Thermal Installation

**Full-or-part-time:** 36h
- Theory classes: 12h
- Laboratory classes: 2h 30m
- Self study : 21h 30m

**2. Hydraulics machines. Turbomachines and volumetrics machines**

**Description:**

**Specific objectives:**
Get classification criteria of the hydraulic machines. Knowing the kinematics of flow in the impeller of turbomachines and their influence on energy transfer in the impeller. Understand the different types of pumps, their essential functional elements and their application areas. Understand the different types of turbines, their essential functional elements and their operating environments. Knowing how to use the similarity to redesign pumps and turbines similar to other existing

**Related activities:**
Laboratory: Pelton turbine

**Full-or-part-time:** 27h 30m
- Theory classes: 9h
- Laboratory classes: 2h
- Self study : 16h 30m


Specific objectives: After completing this section the student will understand the operation and basic design principles of heat exchangers, the thermodynamics of moist air and its application to the design of cooling towers.

Related activities: Laboratory: Heat exchanger, experimental and numerical study (2 sessions)

Full-or-part-time: 26h 30m
Theory classes: 6h
Laboratory classes: 4h 30m
Self study: 16h


Specific objectives: After completing this section, the student will recognize different gas power generation cycles and equipments and the required criteria to perform basic design tasks.

Related activities: Laboratory: alternative compressor

Full-or-part-time: 15h
Theory classes: 6h
Self study: 9h


Specific objectives: After completing this section, the student will recognize different steam power generation cycles and equipment and the required criteria to perform basic design tasks.

Related activities: Laboratory: Thermal power plant I and II (2 sessions)

Full-or-part-time: 25h
Theory classes: 6h
Laboratory classes: 4h
Self study: 15h
- 6. Refrigeration cycles and heat pumps.

Description:

Specific objectives:
After completing this section, the student will recognize different refrigeration cycles and equipment and the required criteria to perform basic design tasks.

Related activities:
Laboratory: Heat pump

Full-or-part-time: 20h
Theory classes: 6h
Laboratory classes: 2h
Self study: 12h

GRADING SYSTEM

The evaluation will be conducted through written tests in the partials and final tests. The exercises and problems will be assessed from the delivery of material by students. Practices will be assessed based on attendance and activity performed in the laboratory together with the preparation and delivery of practice reports.

The students will be carried out an interdisciplinary project together with other subjects of the specialty.

Partials tests: 30%
Exercises / problems: 10%
Practices: 15%
Final test: 40%
Generic competence: 5%

A necessary condition to pass the subject is attending all practices and the completion and delivery of the reports.

The subject have a reevaluation test, following the conditions defined in the academic regulations. The students will be able to access the re-assessment test that meets the requirements set by the EEBE in its Assessment and Permanence Regulations

BIBLIOGRAPHY

Basic: