

30037 - Thermal Generation Systems

Syllabus Information

Academic year: 2023/24

Subject: 30037 - Thermal Generation Systems

Faculty / School: 110 - Escuela de Ingeniería y Arquitectura

Degree: 436 - Bachelor's Degree in Industrial Engineering Technology

ECTS: 6.0

Year: 4

Semester: First semester

Subject type: Optional

Module:

1. General information

The objective of the subject is to enable the student to know, understand and analyse from a technological, energetic, economic and environmental point of view thermoelectric power plants and thermal turbomachines.

It is considered essential that the student has previously passed the subjects "Technical Thermodynamics and Fundamentals of Heat Transmission" and "Thermal Engineering". In addition, it is advisable to know the fundamental concepts of fluid mechanics and machine design.

These approaches and objectives are aligned with some of the Sustainable Development Goals, SDGs, of the Agenda 2030 (<https://www.un.org/sustainabledevelopment/es/>) and certain specific goals, in such a way that the acquisition of the learning results of the subject provides training and competence to the student to contribute in some measure to the achievement of Objectives 7.2 and 7.3 (Goal 7); 8.4 (Goal 8); 9.4 (Goal 9); 11.6 (Goal 11); 12.2 and 12.4 (Goal 12) and 13.3 (Goal 13).

2. Learning results

In order to pass this subject, the students shall demonstrate they has acquired the following results:

- Knows the different types of thermoelectric power plants and thermal turbomachines.
- Knows and understands the operation of thermoelectric power plants and thermal turbomachines.
- Applies techniques and methods from various disciplines for the analysis and design of thermoelectric power plants and thermal turbomachines
- Knows and understands the control and regulation systems of thermoelectric power plants and thermal turbomachines
- Knows the fundamentals of the economic and environmental analysis of thermoelectric power plants.
- Knows the operation and maintenance of thermoelectric power plants and thermal turbomachines.

3. Syllabus

1.- Introduction

2.- Types of thermoelectric power plants:

- Conventional
- Atmospheric fluidized bed
- Nuclear
- Combined cycles
- Pressurized fluidized bed
- Integrated gasification with combined cycle
- Organic Rankine Cycle

3.- Power boilers

4.- Control and regulation of thermoelectric power plants

5.- Biomass and co-firing

6.- Energy analysis of thermoelectric power plants

7.- Environmental analysis of thermoelectric power plants

8.- Analysis of ground and airborne gas turbines

9.- Action and reaction blades of axial turbines. Analysis and comparison of staggering

10.- Regulation of thermal turbomachines

4. Academic activities

In order for students to achieve the learning results described above and to acquire the competencies designed for this subject, the following training activities are proposed:

1. **Lectures**, in which the teacher will explain the basic principles of the subject and will solve some representative problems.
2. **Laboratory practices and / or computer tools** that are distributed throughout the term and whose valuation will be part of the final grade of the subject.
3. **Tutored work in small groups**: students analyse in depth a topic related to the content of the subject.
4. **Additional exercises, questions and problems** in addition to those solved in class.
5. **Academic tutorials**: the teacher will make available to the student procedures for the approach and resolution of doubts.

5. Assessment system

Evaluation activities

1) Laboratory practices and/or with computer tools. Duration: 2-4 h. The student becomes familiar with the thermoelectric power plants and/or thermal turbomachines, their components, constructive aspects, operation and design. Applies the knowledge of the subject and delivers a report of results.

2) Tutored Works. Estimated duration: 15 h. The student with the guidance of the teacher solves complex problems and delivers a report of results.

4) Written examination. It will consist of two different parts: one part in the form of short theoretical-practical questions and a second part that will consist of solving some of the problems or questions similar to those raised in the practical activities (those students who have passed this part during the teaching period will be exempt).

Assessment procedures

1st and 2nd Call: the procedure consists of a set of tests that allow passing 100% of the subject . Some of them, the practical ones, will take place during the teaching period, while the written exam will be held during the exam period . The final grade will be calculated by weighting the grades of each of the parts, according to the following weights:

- 70 % written exam (Theory and Problems)
- 20 % Tutored work (voluntary completion and delivery)
- 10 % Practical activities (compulsory completion and delivery)

In the case that the student has not done the tutored work, the written exam (which will be the same as in the case of having done the tutored work) will have a weight of 90%

In the event that the student has not passed the practical activities during the teaching period or wants to raise the grade obtained in that part, they will be entitled to a practical exam that will take place during the exam period and that will have a weight in the final grade of 10%. This exam will consist of the resolution of one of the practices proposed along of the teaching period, assigned by the teacher at the time of the exam.