

## 66427 - Design of thermal systems

### Syllabus Information

---

**Academic Year:** 2020/21

**Subject:** 66427 - Design of thermal systems

**Faculty / School:** 110 - Escuela de Ingeniería y Arquitectura

**Degree:** 536 - Master's in Mechanical Engineering

**ECTS:** 4.5

**Year:** 1

**Semester:** Second semester

**Subject Type:** Optional

**Module:** ---

### 1.General information

#### 1.1.Aims of the course

#### 1.2.Context and importance of this course in the degree

#### 1.3.Recommendations to take this course

### 2.Learning goals

#### 2.1.Competences

#### 2.2.Learning goals

#### 2.3.Importance of learning goals

### 3.Assessment (1st and 2nd call)

#### 3.1.Assessment tasks (description of tasks, marking system and assessment criteria)

### 4.Methodology, learning tasks, syllabus and resources

#### 4.1.Methodological overview

The methodology followed in this course is oriented towards achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as:

1. **Lectures**, given to the entire group, in which the teacher will explain the basic principles of the course and solve some representative problems of implementation in real cases. Student participation and autonomous work will be encouraged.
2. **Practice sessions**. Computer simulations and laboratory sessions are distributed throughout the semester and its assessment will form part of the final grade of the course.
3. **Assignment**. Critical analysis of the state of the art of equipment and advanced energy systems. Application of specialized software tools for the analysis, design and/or operation of equipment and advanced energy systems.
4. **Tutorials**. The teacher will solve student's doubts. Mandatory tutorials for monitoring case studies and the assignment will be scheduled.

#### 4.2.Learning tasks

The course includes the following learning tasks:

- Lectures (type T1). They will present the theoretical concepts, basic equipment, and thermal installations and their application in advanced energy production systems. The syllabus includes:
  - Energy sources. renewable and non-renewable energy in heating installations.

- Sources specializing in advanced equipment and systems for energy production information.
- Thermal solar energy. solar thermal installations. Applications in industry and buildings.
- Advanced technologies for electricity production. Solar Thermal Power. clean coal. Fuel cells and hydrogen.
- Advanced systems cogeneration and polygeneration. energy recovery from waste.
- Distributed generation. District heating and cooling. Energy storage.
- Evaluation and optimization of energy systems. Energy, economy and sustainability
- Laboratory Practice Sessions (type T3).
- Assignments (T6 type). The students will do an individual assignment on a topic proposed by the teacher throughout the semester. With some regularity, the teacher will schedule tutoring sessions in order to keep track of its progress.

### **4.3.Syllabus**

The course will address the following topics:

1. Energy resources. Renewable and conventional energy resources in thermal plants.
2. Specialized sources of technical information for devices and advanced energy systems.
3. Solar thermal energy. Solar thermal energy plants. Applications to the industry and to the residential-commercial sector.
4. Advanced power plants. Thermoelectric Solar. Clean coal technologies. Fuel cells and hydrogen.
5. Advanced cogeneration and polygeneration systems. Waste to energy.
6. Distributed generation. District heating and cooling. Energy storage.
7. Evaluation and optimization of energy systems. Energy, economy and sustainability.

### **4.4.Course planning and calendar**

Communication between the student and the teacher will be managed via the virtual platform (ADD). Here the teacher can distribute course materials (notes, presentations, problems and solved cases, technical and economic information on equipment and thermal installations and advanced energy production systems, specialized software, etc.), make announcements and notifications to students, etc.

### **4.5.Bibliography and recommended resources**