Academic Year/course: 2022/23

66370 - Solar Thermal Power Plants

Syllabus Information

Academic Year: 2022/23
Subject: 66370 - Solar Thermal Power Plants
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 636 - Master's in Renewable Energies and Energy Efficiency
ECTS: 3.0
Year: 1
Semester: Second semester
Subject Type: Optional
Module:

1. General information

1.1. Aims of the course

Introduction to Concentrating Solar Power Plants

- Current state worldwide
- Peculiarities of the subsystems: thermal collectors and storage systems.
- Basic technical calculations
- Financial analysis and comparison with PV power

1.2. Context and importance of this course in the degree

This subject is included in the thermal systems optional module taught during the first year's second semester. The subjects of this optional module allow the student to intensify their skills and specialize in technologies related to renewable energies and energy efficiency concerning thermal systems.

After completing the subjects of the first semester, students must complete 30 ECTS of the specialization module to complete the training in renewable energies and energy efficiency. To obtain the "Thermal Systems" specialization, the student must complete at least 24 ECTS in subjects of this module and complete the TFM in the said specialization.

1.3. Recommendations to take this course

The ideal is to have completed the compulsory subject of the same master's degree "Solar Energy", or failing that, contents of Renewable Energies of degrees or masters.

2. Learning goals

2.1. Competences

General

CG4.- Follow the technological evolution of renewable energies and have prospective knowledge of this evolution.

CG5.- Apply knowledge of advanced sciences and technologies to the professional or investigative practice of efficiency.

CG7.-Assess the application of emerging technologies in energy and the environment.

CG8.- Develop the ability to advise on the best way or channel to optimize energy resources concerning renewable energies.

Specific

CE2.- Develop and execute renewable energy projects.

CE5.- Identify energy management, improvement and optimization processes in industry.

CE6.- Evaluate energy-saving techniques in the domestic and tertiary sectors.

CE10.- Plan solar exploitation systems (thermal and electrical).

2.2. Learning goals

In this subject an Introduction to solar concentration power plants is carried out, with the following learning outcomes:

- Current state of the world
- Peculiarities of the subsystems: thermal collectors and storage systems.
- Basic technical calculations
- Financial analysis and comparison with PV power

2.3. Importance of learning goals

This subject is included in the thermal systems optional module taught during the first year's second semester. The subjects of this optional module allow the student to intensify their skills and specialize in technologies related to renewable energies and energy efficiency concerning thermal systems.

3. Assessment (1st and 2nd call)

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

Continuous assessment:

Group work will be carried out on the dimensioning and technical and financial performance of a solar thermal power plant. This will be scored on 30% of the final grade, being necessary a grade higher than 4/10

Each student will be examined by making variations of data or procedures on the work done in the group. The exam will score 70% of the final grade, requiring a grade higher than 4/10

Global evaluation:

An examination about dimensioning and thermal and financial performance of a solar thermal power plant.

4. Methodology, learning tasks, syllabus and resources

4.1. Methodological overview

Oral presentations and supervised teamwork.

4.2. Learning tasks

Oral presentations and supervised teamwork.

4.3. Syllabus

1. Introduction to solar thermal power plants. History, current situation, and general types. Basic operating equations.

Descriptive of plants: solar field, power systems, thermal storage systems:

2. Parabolic trough power plants. Steam cycle plants. Hybridization with CCTG (ISC)

3. Solar tower power plants and heliostat field. Saturated steam, superheated steam and molten salt plants.

4. Fresnel concentrator plants.

5. Other types abandoned or under development. Tower with ground reflection. Steerable parabolic dishes and Stirling motors. Solar ovens. Solar chimney.

Solar plant calculations:

Solar data. PVGIS database. Selection and transformation of values. Electricity market data. Reliable financial data sources on the Internet.

4.4. Course planning and calendar

De acuerdo a los calendarios, horarios y convocatorias oficiales del centro.

Fechas de entrega de trabajos y examen de evaluación continua a fijar con los estudiantes.

4.5. Bibliography and recommended resources

M. Romero-Álvarez, E. Zarza, 2007. ?Concentrating Solar Thermal Power?, en *Handbook of Energy Efficiency and Renewable Energy*, Cap. 21, Taylor and Francis

K. Lovegrove, W. Stein (Eds.), 2012. *Concentrating solar power technology. Principles, developments and applications*. Woodhead Publishing

Z. Wang, 2019. *Design of Solar Thermal Power Plants*. Chemical Industry Press: Academic Press