Universidad Zaragoza

Year : 2020/21

66334 - Solar and biomass energy

Syllabus Information

Academic Year: 2020/21
Subject: 66334 - Solar and biomass energy
Faculty / School: 110 - Escuela de Ingeniería y Arquitectura
Degree: 330 - Complementos de formación Máster/Doctorado
535 - Master's in Renewable Energies and Energy Efficiency
ECTS: 10.0
Year: XX
Semester: 330 - First semester
535 - First semester
535 - First semester
535 - First semester
Subject Type: 535 - Compulsory
330 - ENG/Complementos de Formación
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. In theory sessions the basic concepts are explained and related to the technical process characteristics. Short exercises are solved on the board, serving as support to assure understanding of the concepts. In both cases the basic methodology used is the lecture.

In the practice sessions, laboratory experiments are combined with computer sessions in which students work in more complex case studies than those presented in theory sessions.

In addition, the students conduct an assignment supervised by the teacher, where they apply in a concrete and practical way the concepts presented in class.

4.2.Learning tasks

The course includes the following learning tasks:

- A01 Lectures (50 hours). Presentation of theoretical contents by a faculty or by external experts to all students enrolled in the course. Although it is not a mandatory activity, regular attendance is highly recommended.

- A02 Problem and case solving (25 hours). Solve practical problems and exercises with all the students. Although it is not a mandatory activity, regular attendance is highly recommended.
- A03 Laboratory sessions (25 hours). Students will work actively in groups to solve practical exercises.
- A06 Guided assignments (40 hours). Students will complete assignments, problems and exercises related to concepts seen in laboratory sessions and lectures.
- A07 Autonomous work (100 hours). Students are expected to spend about 100 hours to study theory, solve problems and prepare lab sessions
- A08 Assessment (10 hours).

The indicated hours are for guidance and will be adjusted depending on the academic calendar.
At the beginning of the course, lecturers will communicate the schedule of practice sessions, which will be set according to the syllabus and the availability of laboratories and computer rooms.

4.3.Syllabus

The course will address the following topics:

Topic 1. Solar resource

- 1.1. Physical characteristics and spectral distribution of the solar radiation. Extraterrestrial irradiation and atmospheric effect.
- 1.2. Geometry of the sun's movement, calculus of coordinates and sun trajectory charts.
- 1.3. Solar radiation measurement. Measurement instruments and databases.
- 1.4. Incidence in a solar collector. Optimum orientation and inclination. Shadow determination.
- 1.5. Applications and technologies of solar energy exploitation.

Topic 2. Low temperature solar energy

- 2.1. Introduction. Situation of the sector.
- 2.2. Low-temperature solar thermal collectors.
- 2.3. Solar collector efficiency curve.
- 2.4. Basic components of a typical installation.
- 2.5. Basic dimensioning of low-temperature solar thermal installations.

Topic 3. Photovoltaics

- 3.1. Introduction to photovoltaics. Current status, future, applications.
- 3.2. Fundamentals of the PV cells.
- 3.3. PV modules.
- 3.4. Inverters and other equipment. Balance of Systems (BOS).
- 3.5. Sizing of Grid-connected PV systems
- 3.6. Sizing methods for Grid connected PV systems.
- 3.7. PV Self-consumption.
- 3.8. Economic and legal aspects.

Topic 4. Biomass energy

- 4.1. General perspective and state of art. Definitions.
- 4.2. Dry waste biomass and energy crops. Resource evaluation.
- 4.3. Biomass pretreatment processes for energy use. Drying, milling, pelletizing. Biomass storing and handling systems.
- 4.4. Thermochemical transformations of biomass. Combustion, Gasification, Pyrolysis. Technologies and installations.
- 4.5. Economic, legislative and environmental aspects of biomass systems.

4.4.Course planning and calendar

Further information concerning the timetable, classroom, assessment dates and other details regarding this course, will be provided on the first day of class.

4.5.Bibliography and recommended resources