

66342 - Advanced solar energy

Información del Plan Docente

Academic Year	2016/17
Academic center	110 - Escuela de Ingeniería y Arquitectura
Degree	535 - Master's in Renewable Energies and Energy Efficiency
ECTS	5.0
Course	1
Period	Second semester
Subject Type	Optional
Module	---

1.Basic info

1.1.Recommendations to take this course

1.2.Activities and key dates for the course

2.Initiation

2.1.Learning outcomes that define the subject

2.2.Introduction

3.Context and competences

3.1.Goals

3.2.Context and meaning of the subject in the degree

3.3.Competences

3.4.Importance of learning outcomes

4.Evaluation

5.Activities and resources

5.1.General methodological presentation

The teaching methodology combines coordinated theoretical and practical activities , promoting self work and promoting active work in groups.

5.2.Learning activities

In the theory sessions, the background aspects are explained and related to the technical characteristics of solar

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processes. Short exercises are developed on the board, serving as support to secure the understanding of the concepts . In both cases the methodology are master classes. In the practical sessions, laboratory experiments are combined with computer sessions in which more complex exercises than those presented on the board , where it is necessary for solving some practical computational power, are studied. Several assignments are also included.

5.3.Program

- Dynamics simulation of low-temperature solar thermal systems.
- Photovoltaic - thermal hybrid collectors. Operating principles and applications.
- Generation of cold from solar energy. Physical fundamentals and current state of the technology.
- Solar thermal concentrating systems: parabolic trough collectors, linear Fresnel collectors, solar tower, Stirling disks, solar ovens. Operating principles and applications.
- Applications: electricity, steam process use , integrated solar combined cycles (ISCC) , solar energy in the chemical industry , solar desalination , hydrogen production from solar energy ...
- Case studies: simulation of solar systems in specific applications.

5.4.Planning and scheduling

Planning and scheduling of activities will be explained the first day and it will be also available on the website of the course (<https://moodle2.unizar.es/add/>)

5.5.Bibliography and recommended resources

- Duffie, John A.. Solar engineering of thermal processes / John A. Duffie, William A. Beckman . - 2nd ed. New York [etc.] : John Wiley and Sons, 1991
- Goswami, D. Yogi. Principles of solar engineering / D. Yogi Goswami, Frank Kreith, Jan F. Kreider . - 2nd ed. Philadelphia [etc.] : Taylor & Francis, cop. 2000
- Ibañez, M. Tecnología solar / M. Ibañez, J.R. Rosell, J.L. Rosell Mundi-Prensa
- Energías renovables para el desarrollo / José M^a De Juana Sardón, coordinador, coordinador ; Adolfo de Francisco García ... [et al.] . - 1^a ed., 2^a reimp. Madrid : Thomson Paraninfo, imp. 2007
- Kalogirou, Soteris. Solar energy engineering [recurso electrónico] : processes and systems / Soteris A. Kalogirou . Burlington, MA : Elsevier/Academic Press, cop. 2009
- Romero-Álvarez, M., Zarza, E. Concentrating Solar Thermal Power. En: CRC Handbook of Energy efficiency and Renewable Energy/ Edited by Frank kreith and D. Goswami. Boca Raton [etc.] : CRC Press, cop. 2007