66334 - Solar and biomass 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 330 - Complementos de formación Máster/Doctorado
ECTS	10.0
Course	XX
Period	Half-yearly
Subject Type	ENG/Complementos de Formación, Compulsory
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 learning process designed for this course is based on the following main activities: Theory sessions in which basic concepts are explained and related to the technical process characteristics. Short exercises are used that are solved on the board, serving as support to assure understanding of the concepts. In both cases the basic methodology used is master class.

In the practical 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 program also includes several self-work activities: by conducting a work supervised by the teacher the students apply in a concrete and practical way the concepts presented in class.

5.2.Learning activities

The learning process designed for this course is based on the following main topics:

1) Lectures, given to the whole group, where the teacher explains the basics of the subject and solves some real representative problems useful for future professional practice. Students' involvement in this activity is encouraged. At the same time, self student work is necessary to better use of the lessons **.**

2) Laboratory sessions and computer lab sessions, which are distributed throughout the semester and whose evaluation will be part of the final score of the course. Groups of two students will be formed in order to encourage learning and teamwork.

3) Work tutored in small groups (couples ideally): through a computer tool students analyze and solve a problem of the subject. This enhances independent studying, learning and applying it to the resolution of the proposed exercises.

4) Exercises, questions and additional problems to those solved during classes. With these tools the autonomous work is encouraged, studying the matter and applying it to the resolution of the proposed exercises. Although this activity is supervised by the teacher, self-execution is fundamental for the sturdent learning process and for evaluation purposes.

5) Academic tutorial: the teacher will provide student certain procedures for the approach and questions solving. The use of these tutorials is highly recommended to ensure adequate progress in learning.

5.3.Program

1. Solar resource

1.1. Physical characteristics and spectral distribution of the solar radiation. Extraterrestrial irradiation and atmospheric effect.

1.2. Geometry of sun's movement, calculus of coordinates and sun trayectory 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. Aplications and technologies of solar energy exploitation

2. Low temperature solar energy

2.1. Introduction. Situation of the sector.

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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.

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.

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 installlations.

4.5. Economic, legislative and environmental aspects of biomass systems.

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5.4.Planning and scheduling

Since the very beginning teachers in charge of the course will provide students with the detailed timetable of the classes and the deadline of the work to be delivered during the semester

5.5.Bibliography and recomended 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
- Ibáñez Plana, Manel. Tecnología solar / M. Ibáñez Plana, J.R. Rosell Polo, J.I. Rosell Urrutia. Madrid [etc.] : Mundi-Prensa, 2005
- Energías renovables para el desarrollo / José Mª De Juana Sardón, coordinador, coordinador ; Adolfo de Francisco García ... [et al.] . - 1ª ed., 2ª 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
- Zabalza Bribian, Ignacio. Energía solar térmica / Ignacio Zabalza Bribian y Alfonso Aranda Usón . - 1ª ed. Zaragoza : Prensas Universitarias de Zaragoza, 2009
- Bayod Rújula, Ángel Antonio. Sistemas fotovoltaicos / Angel Antonio Bayod Rújula . - 1ª ed. Zaragoza : Prensas Universitarias de Zaragoza, 2009
- Energía de la biomasa / Fernando Sebastián Nogués, Daniel García-Galindo y Adeline Rezeau (coordinadores) ; Javier Ábrego Garrués ... [et al.] . - 1ª ed. Zaragoza : Prensas Universitarias de Zaragoza , 2010
- Van Loo,Sjaak. Handbook of biomass combustion and co-firing / Sjaak Van Loo, Jaap Kopejan Routledge, 2007
- Planning and installing bioenergy systems : a guide for instalers, architects and engineers / German Solar Energy Society (DGS), Ecofys. Routledge
- Handbook of Alternative Fuel Technologies / Sunggyu Lee , James G. Speight , and Sudarshan K. Loyalka CRC Press 2007