Universidad Zaragoza

Year : 2019/20

25222 - Clean technologies. Renewable energies

Syllabus Information

Academic Year: 2019/20
Subject: 25222 - Clean technologies. Renewable energies
Faculty / School: 201 -

Degree: 277 - Degree in Environmental Sciences
571 - Degree in Environmental Sciences

ECTS: 6.0
Year: 571 - Degree in Environmental Sciences: 3
277 - Degree in Environmental Sciences: 3

Semester: Second Four-month period
Subject Type: Compulsory
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 the achievement of the learning objectives. A wide range of teaching and learning tasks are implemented, such as lectures, practice sessions, fieldwork, cooperative learning, tutorials and autonomous work and study.

4.2.Learning tasks

This course is organized as follows:

- **Lectures** (26 hours). These sessions will be participative and students will be encouraged to participate actively asking and answering questions and solving short exercises.
- **Practice sessions** in the computer classroom (20 hours). Group work and collaborative learning will be focused on solving a series of problems and case studies.
- **Fieldwork** (2 trips). They will provide students with demonstrable knowledge on the topics covered during the course.

- **Cooperative learning**: during the practical sessions (in class) and the collaborative project in groups of 3 members (out of class).
- **Autonomous work and study**: students will be encouraged to resolve several exercises and questionnaires related to the subjects covered in the classroom. They will post the solution on the Moodle site and interact with each other.
- **Tutorials.** Individual or small-group, which can be face-to-face or virtual (using the Moodle platform).

4.3.Syllabus

This course will address the following topics:

Lectures

- Topic 1. Introduction: basic concepts on energy.
- Topic 2. Solar photovoltaic energy: semiconductors, photovoltaic panels, accumulation subsystems, regulation and power adaptation, dimensioning of photovoltaic systems.
- Topic 3. Solar Thermal Energy: uses of solar thermal energy, cylinder parabolic collectors, characteristic parameters, solar power tower.
- Topic 4. Wind power: wind resources, power produced by a wind-driven generator, wind machines, components of a wind-driven generator, uses and environmental impact.
- Topic 5. Fundamentals of heat transfer and heat exchangers.
- Topic 6. Energy and climate change.
- Topic 7. Generating energy from fossil resources. Carbon combustion (effectiveness and environmental aspects), types of combustors, contaminant emissions control, clean coal technology.
- Topic 8. Generating energy from biomass: concept of biomass and classification, thermal conversion of biomass (pyrolysis, combustion and gasification), alcoholic fermentation (obtaining bioethanol), producing biodiesel, anaerobic digestion, social and environmental aspects associated with the use of biomass energy.

Practice sessions (resolution of 10 problems/case studies related to the subjects above).

4.4.Course planning and calendar

Schedule

Week	Lectures	Practice sessions	Trips
1	2 h	Cooperative project (2 h)	
2	2 h	Session 1 (2 h)	
3	2 h	Session 2 (2 h)	
4	2 h	Session 3 (2 h)	
5	4 h	Session 4 (2 h)	
6	2 h	Session 5 (2 h)	
7	2 h		
8	2 h	Session 6 (2 h)	
9		Session 7 (2 h)	Field visit (5 h)

10	2 h		
11	2 h	Session 8 (2 h)	
12	2 h	Session 9 (2 h)	
13	2 h	Session 10 (2 h)	
14	2 h	Cooperative project (2 h)	
15		Oral presentation of the cooperative projects (2 h)	

Workloa

4.5.Bib and recomr resour

Activity	Classroom hours	Factor	Out of class hours
Lectures	26	1.5	39
Practice sessions	20	1.5	30
Collaborative work	6	-	21
Fieldwork	3	-	-
Evaluation	5	-	-
Total	60		90
Total Workload		**150 h**	

BB Çengel, Yunus A.. Termodinámica / Yunus A. Çengel, Michael A. Boles ; revisión técnica, Sofía Faddeeva Sknarin. 6ª ed. Mexico [etc.] : McGraw-Hill Interamericana, cop. 2009

BB González Velasco, Jaime. Energías renovables / Jaime González Velasco . Barcelona [etc.] : Reverté, D.L. 2009

BC Çengel, Yunus A.. Transferencia de calor y masa : un enfoque práctico / Yunus A. Çengel ; revisor técnico Sofía Faddeva . 3ª ed. México D. F. : McGraw-Hill Interamericana, cop. 2007

BC Quaschning, Volker. Understanding Renewable Energy Systems / Volker Quaschning . 1st. ed. repr. London : Earthscan, 2005 (reimp. 2010)

BC Twidell, John. Renewable energy resources / John Twidell and Tony Weir . 2nd ed. reimp. London ; New York : Taylor & Francis, 2006 (reimp. 2009)

Links:

European Commision-Energy
[http://ec.europa.eu/energy/index_en.htm]

Instituto para la Diversificación y Ahorro de la Energía, IDAE
[http://www.idae.es/]

National Renewable Energy Laboratory, NREL
[http://www.nrel.gov/]

Portal de las Energías Renovables,CIEMAT
[http://www.ciemat.es/]

The updated recommended bibliography can be consulted in:
http://psfunizar7.unizar.es/br13/egAsignaturas.php?codigo=25222&Identificador=C70911