COURSE DATA

Data Subject	
Code	36540
Name	Renewable energies
Cycle	Grade
ECTS Credits	6.0
Academic year	2022 - 2023

Study (s)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	School of Engineering	4	Second term

Subject-matter

Degree	Subject-matter	Character
1404 - Degree in Industrial Electronic Engineering	21 - Optional subjects	Optional

Coordination

Name	Department
EJEA MARTI, JUAN BAUTISTA	242 - Electronic Engineering
GARCIA GIL, RAFAEL	242 - Electronic Engineering

SUMMARY

The optional subject "Renewable Energies" is taught in the fourth year of the Degree on Industrial Electronics Engineering. The overall teaching load is 6 ECTS. The workload for the student is 150 hours over the semester: 90 hours of individual homework and 60 hours of classroom lessons.

The general objectives of the subject are to provide the student with the knowledge necessary to understand the principle of operation and applications of the different alternative energy sources with special emphasis on solar thermal, photovoltaic and wind energy. Students will learn the regulations applicable to installations based on renewable energies and will have the ability for sizing solar energy installations (both photovoltaic as solar thermal of low temperature).

PREVIOUS KNOWLEDGE

Relationship to other subjects of the same degree

There are no specified enrollment restrictions with other subjects of the curriculum.

Other requirements

There are no requirements.

COMPETENCES (RD 1393/2007) // LEARNING OUTCOMES (RD 822/2021)

1404 - Degree in Industrial Electronic Engineering

- CO1 - More comprehensive skills than those acquired in compulsory subjects must be acquired in elective subjects.

LEARNING OUTCOMES (RD 1393/2007) // NO CONTENT (RD 822/2021)

This subject allows to obtain the following learning outcomes:

- Know the different sources of alternative energy, their sustainability and implications for the environment.
- Know how to specify the different sources of alternative energy and especially solar photovoltaic, solar termal and wind energy.
- Be able to design and project an alternative energy system at the block diagram level.
- Know the regulatory aspects and legislation on low temperature thermal solar energy.
- Know the regulatory aspects and legislation on photovoltaic solar energy.
- Know how to use dynamic simulation tools to project and optimize a solar installation.
- Know how to size an ACS solar thermal installation.
- Know how to size an autonomous photovoltaic solar installation.
- Know the operation of a wind energy system.

DESCRIPTION OF CONTENTS

1. INTRODUCTION TO RENEWABLE ENERGY

Topic 1: INTRODUCTION TO RENEWABLE ENERGY

1.1. Concept of renewable energy.
1.2. Classification of renewable energy.
1.3. Regulation: CTE.

PRACTICE 1: Presentation of some type of renewable energy (biomass, energies from the sea, geothermal energy, hydroelectric energy or fuel cells).

2. SOLAR RADIATION

Topic 2. SOLAR RADIATION.
2.1. Solar radiation and its measurement.
2.2. Parameters that affect the incident radiation on a solar panel.
2.3. Losses of solar radiation: by orientation and inclination and by shading.

3. SOLAR THERMAL ENERGY

Topic 3. SOLAR THERMAL ENERGY.
3.1. Main elements of a low temperature solar thermal system.
3.1.1. Solar collectors. Efficiency.
3.1.2. Distribution system.
3.1.3. Storage system.
3.1.4. Conventional support system.
3.2. Types of low temperature solar systems.
3.3. Sizing of facilities and applicable regulations.

PRACTICE 2: Efficiency of a low temperature solar collector.
PRACTICE 3: Dynamic simulation to design and optimize a solar thermal DHW installation by using commercial software.

4. PHOTOVOLTAIC ENERGY

Topic 4. PHOTOVOLTAIC ENERGY.
4.1. Photovoltaic panels.
4.1.1. Components of a panel.
4.1.2. Characterization of the panel: current-voltage curves and its dependence on temperature and the incident radiation.
4.1.3. Panel efficiency.
4.1.4. Types of panels.
4.2. Photovoltaic systems.
4.2.1. System Components: Batteries, regulators, DC/DC converters, inverters (DC/AC).
4.2.2. Types of photovoltaic systems.

4.3. Sizing of facilities and applicable regulations.

PRACTICE 4: Electrical characterization of a photovoltaic installation - Part I.
PRACTICE 5: Electrical characterization of a photovoltaic installation - Part II.
PRACTICE 6: Dynamic simulation to design and optimize an autonomous photovoltaic solar installation by using commercial software.

5. WIND ENERGY

Topic 5: WIND ENERGY
5.1. Operation of a wind turbine.
5.2. Wind Turbine Components.
5.3. Types of wind turbines.
5.4. Wind plant.

PRACTICE 7: Wind energy kit.

WORKLOAD

ACTIVITY	Hours	% To be attended
Theory classes	40,00	100
Laboratory practices	20,00	100
Development of group work	18,00	0
Study and independent work	20,00	0
Preparing lectures	35,00	0
Preparation of practical classes and problem	17,00	0
TOTAL	**150,00**	

TEACHING METHODOLOGY

The development of the course is structured around three axes: learning with the teacher (theory sessions and problems), laboratory sessions and a workshop.

a) Learning in group with the teacher

In the theory sessions the lecture model will be used. The teacher exposes the fundamental contents of the course, using the media at their disposal (presentations, transparencies, blackboard).

In the problem sessions, the teacher will explain several problems corresponding to topics 3 and 4.

b) Laboratory sessions

Lab sessions are aimed to analyze the behavior of solar thermal collectors, solar panels and a wind turbine system, and the management of dynamic simulation tools to design and optimize a solar thermal installation or an autonomous solar photovoltaic installation.

c) Workshop (work in group)

The theoretical concepts introduced in lectures will be complemented by performing a seminar-workshop. This seminar will be prepared by all students organized into small groups (2-3 students). The work will be presented in the laboratory and will be evaluated both the quality of the presentation and the answer to the questions made by the teacher and other students.

Individual mentoring

Students will have a schedule of individual mentoring whose purpose is to solve problems, questions, guidance on homework, etc. The schedule will be indicated at the beginning of the academic course. The students will also have the possibility to clarify some questions via email or discussion forums by using the tool "Aula Virtual" which is provided by the University of Valencia.

EVALUATION

The knowledge acquired by the student shall be assessed in the two following ways: firstly, by continuous assessment on the first call or by an alternative assessment on the second call.

Continuous Assessment System

Throughout the course, two controls (CTR1, CTR2) that contain theoretical issues will be made (evaluation of competence C01). Both controls will count a 20% of the final mark. It will be mandatory to obtain an average mark between CTR1 and CTR2 higher than 4/10.

The laboratory sessions (Lab) will be evaluated through the delivery of some questions made by the teacher. The weight in the final mark will be 20%.

In addition, the student will present a Seminar-Workshop (ST) with a weight of 10% in the final grade.

An attendance to the laboratory sessions higher than 80% is mandatory to pass the subject.

In addition, there will be a Final Exam (EP) of problems with a 30% weight in the final mark (evaluation of competence C01). A minimum of 4/10 is required in this exam to pass the subject.

In this way, the total mark of the subject will be obtained in the form:

Final Mark = 0,20 x CTR1 + 0,20 x CTR2 + 0,30 x EP + 0,1 x ST + 0,2 x Lab

Second Call Assessment

This is based on a Final Exam of Theory-Problems (EF) with a weight of 70% (evaluation of competence C01). A minimum of 4/10 is required in this exam to pass the subject.

The final mark of the subject will be obtained in the form:

Final Mark = 0,7 x EF + 0,2 x Lab + 0,1 x ST

Advance call assessment

To request for an advanced call, students must have done the practical sessions and must submit the required ST documentation.

In any case, the evaluation system will be set by "Reglamento de Evaluación y Calificación de la Universidad de Valencia para Grados y Masters"

(https://webges.uv.es/uvTaeWeb/MuestraInformacionEdictoPublicoFrontAction.do?accion=inicio&idEdictoSeleccionado=5639)

REFERENCES

Basic

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- González Velasco, J., Energías Renovables, 1a Edición, Editorial Reverté, S.A, 2009. ISBN: 978-84-291-9312-1 (ebook)
- Méndez Muñiz, J. M., Energía Solar Térmica, 3a Edición, FC EDITORIAL, 2011. ISBN: 978-84-156-8375-9 (ebook)
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Additional

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