COURSE DATA

DATA SUBJECT

Code: 36540
Name: Renewable energies
Cycle: Undergraduate Studies
ECTS Credits: 6
Academic year: 2026-27

STUDY (S)

Degree	Center	Acad. year	Period
1404 - Degree in Industrial Electronic Engineering	Escola Tècnica Superior d'Enginyeria	4	Second quarter

SUBJECT-MATTER

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

COORDINATION

EJEA MARTI JUAN BAUTISTA

GARCIA GIL RAFAEL

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 / LEARNING OUTCOMES

1404 - Degree in Industrial Electronic Engineering

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

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. AEROTHERMAL SYSTEMS

TOPIC 5: AEROTHERMAL SYSTEMS

5.1. Basic operating principles.

5.2. Components of air-source heat pump systems.

5.3. Sizing of air-source heat pump installations.

5.4. Typical application examples.

6. WIND ENERGY

TOPIC 6: WIND ENERGY

6.1. Operation of a wind turbine.

6.2. Wind Turbine Components.

6.3. Types of wind turbines.

6.4. Wind plant.

PRACTICE 7: Wind energy kit.

WORKLOAD

PRESENCIAL ACTIVITIES

Activity	Hours
Theory	40,00
Laboratory	20,00
Total hours	**60,00**

NON PRESENCIAL ACTIVITIES

Activity	Hours
Attendance at other activities	0,00
Individual or group project	18,00
Independent study and work	20,00
Preparation of lessons	52,00
Preparation for assessment activities	0,00
Resolution of case studies	0,00
Total hours	**90,00**

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 may be assessed in one of the following two ways: through continuous assessment or through a single final assessment. In second call, students will always be assessed through the single final assessment modality.

In any case, to pass the course, the student must compulsorily complete a Seminar-Workshop (ST), which will account for 10% of the final grade. In the Seminar-Workshop, the degree of preparation, the quality of the presentation (PowerPoint), the clarity of the exposition, as well as the rigor during the Q&A session

(competency C01) will be assessed. Each group will receive a single grade, which will be assigned equally to all its members.

In addition, attendance at laboratory sessions must exceed 80% to pass the course. The laboratory sessions (Lab) will be evaluated based on the submission of a set of questions assigned by the teaching staff. These sessions will account for 20% of the final grade.

The presentation and defence of the Seminar-Workshop (SW), as well as attendance at the laboratory sessions, are considered non-recoverable and mandatory activities for passing the course.

Continuous Assessment System

Throughout the course, two midterm exams will be held: the first one (CTR1) in the middle of the semester, and the second one (CTR2) on the date set by the Centre for the first call exam.

The first midterm exam (CTR1) will include theoretical-practical questions (competency C01) from Topics 1, 2, and 3, as well as a sizing problem of a solar thermal installation (Topic 3). This exam will be compensable if the grade is equal to or higher than 4 out of 10.

The second midterm exam (CTR2) will include theoretical-practical questions (competency C01) from Topics 4, 5, and 6, as well as a sizing problem of a photovoltaic system (Topic 4). This exam will be compensable if the grade is equal to or higher than 4 out of 10.

Both CTR1 and CTR2 will each account for 35% of the final grade.

Thus, the final course grade will be calculated as follows:

Final Mark = 0,35 x CTR1 + 0,35 x CTR2 + 0,1 x ST + 0,2 x Lab

Final Assessment System

It is based on a Final Theory-Problems Exam (EF), taken in both the first and second call, with a total weight of 70% (assessment of competency C01). In the first call, this assessment method must be followed by students who did not obtain a grade equal to or higher than 4 out of 10 in CTR1.

It is mandatory to obtain a minimum score of 4 out of 10 on this Final Exam in order to pass the course.

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)

Copying or plagiarism of any activity that is part of the evaluation will result in the impossibility of passing the course, and the student will then be subject to the appropriate disciplinary procedures indicated in the ACTION PROTOCOL FOR FRAUDULENT PRACTICES AT THE UNIVERSITY OF VALENCIA (ACGUV 123/2020).

REFERENCES

- Pareja Aparicio, M., Radiación solar y su aprovechamiento energético, Editorial Marcombo, 2010. ISBN: 978-84-267-1559-3 (ebook)
- 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)
- M. Ibáñez Plana, J.R. Rosell Polo, J.I. Rosell Urrutia, Tecnología Solar, Ediciones Mundi-Prensa, 2005, ISBN: 84-8476-199-1.
- Méndez Muñiz, J. M., Energía Solar fotovoltaica, 7a Edición, FC EDITORIAL, 2011. ISBN: 978-84-156-8374-2 (ebook).
- M. Alonso Abella, Sistemas fotovoltaicos: introducción al diseño y dimensionado de instalaciones de energía solar fotovoltaica. SAPT Publicaciones Técnicas, 2005.
- Fernández Salgado, J. M., Guía completa de la energía eólica. AMV Ediciones.
- Fernández Salgado, J. M., Guía completa de la energía solar térmica termoeléctrica. (Adaptada al Código Técnico de la Edificación (CTE) y al nuevo RITE) 4a Edición ampliada, actualizada y corregida, AMV Ediciones, 2010.
- Fernández Salgado, J. M., Compendio de energía solar: fotovoltaica, térmica y termoeléctrica. AMV Ediciones.
- Anne Labouret, Michel Villoz, Energía solar fotovoltaica. Manual práctico. AMV Ediciones.
- Mario Ortega Rodríguez, Energías Renovables. Editorial Paraninfo, 2001.
- Agencia Valenciana de la Energía (AVEN), Guía práctica de la energía solar térmica, 2008.
- M. Castro, C. Sánchez, Energía hidráulica. Monografías técnicas de Energías Renovables, Ed. PROGENSA, 2000.
- M. Castro, C. Sánchez, Energías geotérmicas y de origen marino. Monografías técnicas de Energías Renovables. Ed. PROGENSA, 2000.