COURSE: ALTERNATIVE SOURCES OF ENERGY GENERATION

SUBJECT: Elective
MODULE: M4
STUDIES: Degree in Engineering in Industrial Technologies

GENERAL FEATURES*

Type: ☐ Basic training, ☐ Mandatory, ☑ Elective

☐ Final degree project, ☐ External practices

Duration: Semestral **Semester/s**: 7
Number of credits ECTS: 4
Language/s: Spanish, Catalan, English

DESCRIPTION

BRIEF DESCRIPTION AND JUSTIFICATION (the meaning of the subject in relation to the studies. Between 100 and 200 words.)

Electrochemical processes are an important part of energy generation and its storage. Batteries are being developed fast to respond actual necessities in electric cars, mobile phones and micro generation. In addition, fuel cells are getting more importance as a clean source of electricity. In this subject, the student will learn concepts related with chemistry but with a broad application in Industrial Engineering such as electrochemistry and batteries taking into account its design parameters, materials used and future advances in these technologies.

COMPETENCIES (of the subject according to the competencies pre-assigned in the subject.)

1. Capability to understand and apply basic knowledge like informatics, mechanics and materials for the practice of Industrial Engineering [E.2].
2. Capability to analyze and understand the social and environmental impact of the technical solutions [T.6].
3. Capability to take conscience of the social, cultural and environmental impact impact of the profesional activities related to the technoscientific investigation and industrial production [CP.1].

PREREQUISITES* (modules, subjects, courses or knowledge needed to monitor the course. It can be noted courses which must have been completed.)

Those related to the Basic Module.

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CONTENTS (according to sections which constitute the list of contents of the course to the second level detail.)

Topic 1. Introduction
- Reactions with electron transference.
- Thermodynamics of chemical reactions.
- Kinetics of chemical reactions.
- Catalysis in reactions.
- Corrosion as electrochemical phenomena.

Topic 2. Electrochemical systems of energy storage
- Types
- Construction
- Materials

Topic 3. Hydrogen as a fuel
- Production
- Storage
- Uses

Topic 4. Fuel cells
- Working principles
- Current technology
- Positive and negative aspects

Topic 5. Batteries
- Working principles
- Current technology
- Positive and negative aspects

Topic 6 Photovoltaic
- Working principles
- Current technology
- Positive and negative aspects

PERSONA CIÈNCIA EMPRESA

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METODOLOGY

TRAINING ACTIVITIES* (complete the table relating activities and workload to ECTS credits and competencies.)

Training activities	ECTS Credits	Competencies
Concept Sessions	1.5	E2,T6
Sessions solving exercises, problems and cases	0,5	E2,T6
Seminars	-	
Compulsory activities at the teacher's office	-	
Practical work / laboratory	-	
Presentations	-	
Personal study activities of students	1,5	E2, CP1
Evaluation activities (testing, monitoring controls…)	0,5	E2
TOTAL	**4**	

EXPLANATION OF TEACHING METHODOLOGY (justifying the teaching methods used related to competencies and course contents. Between 100 and 200 words)

The subject is taught using theory sessions. At the end of each chapter, an hour is dedicated to solve some of the exercises of that topic which the students have prepared at home.

A total of 6 hour of class are destined to the solution of exercises that will compute directly to the final mark. For this exercises, the students will use the work done at home. Apart from assisting to class, the students must resolve six sets of exercises.

EVALUATION

METHODS OF EVALUATION* (Complete the table relating assessment methods, competencies and the weight in the rating of the course)

Methods of evaluation	Weight	Competencies
Final exam	40%	E2, T6
Partial exams	-	
Following up activities	50%	E2, T6
Homework and presentations	10%	E2, CP1
Experimental work or fieldwork	-	-
Projects	-	
Evaluation of the company or institution	-	
Participation	-	

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LEARNING OUTCOMES (Explanation of the achievements of students that allow competency assessment, relating to competencies and assessment methods.)

Objetive 1:

- The student must show its own criteria to identify the best method to be applied in each situation.

Objetive 2:

- The student have to show enough knowledge on the different alternatives used in electric generation identifying in each case its positive and negative aspects and its associated impact for the society and the environtment.

EVALUATION (Explanation of the evaluation method of the subject.)

The final mark of the subject is calculated as the mean value between the exam mark and work done at home. The weight of each part is: 40% for the exam, 50% for the follow up activities and a final 10% for the work and its presentation.

EVALUATION OF COMPETENCIES (Define calculation expressions for each competency in terms of the corresponding evaluation activities.)

To evaluate competence E2, the indicator is the final exam mark.
To evaluate competence T6, the indicator used is the overall subject final mark.
To evaluate competence CP1 the indicator used is the work and presentation.

BIBLIOGRAPHY (recommended and student accessible.)

- I. N. Levine; "Fisicoquímica"; 4ª ed., McGraw-Hill, Madrid, 1996.
- C. A. Vincent, B. Scrosati; "Modern Batteries"; Butterworth Heinemann, 2ª ed., EE.UU.1997.
- R. A. Messenger, J. Ventre; "Photovoltaic Systems Engineering"; 2ª ed., CRC Press, EE.UU 2004.
- R. L. Busby; "Hydrogen and Fuel Cells. A comprehensive guide"; 1ª ed., PennWell books, EE.UU. 2005.

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26th june 2013, Dr. Oriol Pou

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29th october 2014, Dr. Oriol Pou

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