[GAOO05] ENERGY STORAGE TECHNOLOGY

GENERAL INFORMATION

Studies	DEGREE IN ENERGY ENGINEERING	**Subject**	ELECTRICAL POWER
Semester	1 **Course** 3	**Mention / Field of specialisation**	
Character	COMPULSORY		
Plan	2013	**Language**	ENGLISH
Credits	4,5 **Hours/week** 1.83	**Total hours**	33 class hours + 79.5 non-class hours = **112.5 total hours**

FACULTY

IRAOLA IRIONDO, UNAI

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	*(No previous knowledge required)*

SKILLS

SKILLS	ECTS
G1A309 - To analyse and implement storage systems for the optimisation of energy efficiency	4,12
G1A313 - To be able to work in multidisciplinary, multilingual environments, and to effectively communicate knowledge, procedures, results and ideas about energy both verbally and in writing.	0,36
Total:	**4,48**

LEARNING RESULTS

RGA326 **[!]** ***Analiza los sistemas de almacenamiento.***

LEARNING ACTIVITIES	CH	NCH	TH
Classroom presentations of relevant concepts and procedures in participatory environments.	12 h.		12 h.
Individual study and work, tests and evaluations.		13,5 h.	13,5 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and oral tests to assess technical skills in the subject.	100%	[!] *La recuperación será un examen escrito. La nota 75% recuperación, 25% examen*
Comments:		**Comments:**

CH - Class hours: 12 h.
NCH - Non-class hours: 13,5 h.
TH - Total hours: 25,5 h.

RGA327 **[!]** ***Selecciona y dimensiona sistemas de almacenamiento de energía en función de la aplicación, obteniendo el máximo rendimiento posible***

LEARNING ACTIVITIES	CH	NCH	TH
Classroom presentations of relevant concepts and procedures in participatory environments.	17 h.		17 h.
Workshop and/or lab practice.	4 h.		4 h.
Individual and/or team computer simulation practice.		11 h.	11 h.
Individual and group exercises.		10 h.	10 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and oral tests to assess technical skills in the subject.	90%	[!] *La recuperación será un examen escrito. La nota 75% recuperación, 25% examen*
undefined	10%	**Comments:**
Comments:		

CH - Class hours: 21 h.
NCH - Non-class hours: 21 h.
TH - Total hours: 42 h.

RGA328 **[!]** ***Aplica conocimientos sobre sistemas de almacenamiento en un entorno real o simulado***

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of group projects and/or POPBL.		36 h.	36 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Project assessment. The following will be taken into account: (a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution. **Comments:**	100%	Continuous evaluation **Comments:** Taking advantage of the meetings with the tutor and the experts, the project is guided, mistakes are corrected and the concrete recommendations to overtake the project are given.

CH - Class hours: 0 h.
NCH - Non-class hours: 36 h.
TH - Total hours: 36 h.

RGA337 **[!]** ***Define los objetivos, realiza la planificación para su consecución y su seguimiento sistemático coordinando su trabajo con los demás miembros del equipo.***

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of group projects and/or POPBL.		2 h.	2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Project assessment. The following will be taken into account: (a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution. **Comments:**	100%	Continuous evaluation **Comments:**

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

RGA338 **[!]** ***Argumenta la selección de las teorias, métodos y/o tecnologías más relevantes que permitan definir y/o solucionar un problema utilizando bibliografía de calidad***

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of group projects and/or POPBL.		2 h.	2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Project assessment. The following will be taken into account: (a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution. **Comments:**	100%	[!] *Evaluación continua* **Comments:**

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

RGA339 **[!]** ***Redacta informes técnicos de forma clara, concisa y estructurada siguiendo las especificaciones establecidas haciendo énfasis en la coherencias entre los distintos apartados .***

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of group projects and/or POPBL.		3 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Project assessment. The following will be taken into account: (a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution. **Comments:**	100%	[!] *Evaluación continua* **Comments:**

CH - Class hours: 0 h.
NCH - Non-class hours: 3 h.
TH - Total hours: 3 h.

RGA340 **[!]** ***Presenta y defiende el trabajo en público de forma clara, concisa y estructurada mediante el uso apropiado de soporte visual según las especificaciones establecidas.***

LEARNING ACTIVITIES	CH	NCH	TH
Development, writing and presentation of group projects and/or POPBL.		2 h.	2 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Project assessment. The following will be taken into account: (a) Throughout the project, continuous assessment of both the individual student and the team, regarding task performance; (b) On completion of the project, the solution provided by the team of students and the corresponding report; (c) Lastly, the oral defence of the project, taking into account both the knowledge acquired and the quality of the presentation, the reasoned justification of the principals and the ultimate reasons for proposing the chosen solution. **Comments:**	100%	[!] *Evaluación continua* **Comments:**

CH - Class hours: 0 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 2 h.

CONTENTS

Energy Storage Systems:

1.- Mechanical storage

- Pumped hydroelectric storage

- Compressed air

- Flywheel

2.- Chemical storage

- Lithium-ion batteries

- Lead acid batteries

- Flow redox

- Future batteries

3.- Electromagnetic storage

- Supercapacitors

- Superconductors

4.- Tthermal storage

- Latent heat

- Sensible heat

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Class presentations	*(No bibliography)*
Video projections	
Lab practical training	
Moodle Platform	