

[GAI104] ELECTRIC POWER CONVERSION

GENERAL INFORMATION

Studies	DEGREE IN ENERGY ENGINEERING		Subject	ELECTRICAL ENERGY
Semester	1	Course	3	Mention / Field of specialisation
Character	COMPULSORY		Language	ENGLISH
Plan	2017	Modality	Adapted Face-to-face	Total hours
Credits	6	Hours/week	2.72	49 class hours + 101 non-class hours = 150 total hours

PROFESSORS

AIZPURU LARRAÑAGA, IOSU

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	Basic electronics Matlab and Simulink

SKILLS

VERIFICA SKILLS

SPECIFIC

GAES09 - Applied knowledge of power electronics.

GENERAL

GACG3 - To take the initiative in problem solving, decision making and creativity, and to communicate and share knowledge and skills, understanding the ethical and professional responsibilities of the business activity in the field of Energy Engineering.

GACG4 - To know how to perform measurements, calculations, valuations, studies, reports, task planning schemes, and other activities pertaining to the field of Energy.

GACG5 - To be able to analyse and assess the social and environmental impact of technical solutions.

GACG8 - To draft and develop energy engineering projects focusing on the design, development and operation of energy applications, systems and services, applying strategies which minimise its impact on the environment.

G_CB6 - To be able to respond adequately in complex situations or situations that call for innovative solutions in both the academic field and work environments within their field of study;

CROSS

GACTR2 - To be able to do their job in cooperative, participatory environments, with awareness of social responsibility.

BASIC

G_CB3 - To be capable of gathering and interpreting relevant data (normally within their field of study) in order to make judgements, reflecting on relevant matters of a social, scientific or ethical nature

LEARNING RESULTS

RG301 Assumes responsibilities in the work team, organizing and planning the tasks to be developed, facing the contingencies and encouraging the participation of its members.

LEARNING ACTIVITIES

Development, writing and presentation of memorandums, reports, audiovisual material, etc.
Relating to projects/POPBLs carried out individually or in teams

CH

NCH

TH

6 h.

6 h.

EVALUATION SYSTEM

W

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

Comments: Assessment of the acquired transversal skills:

Followed methodology to solve the project: team work, decision making methods, conflict management... Project management: Definition of objectives, planning,... Written communication Oral communication

100%

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous assesment. The project is managed through the tutoring meetings and the meetings held with the experts, errors are corrected and the precise guidelines are given to overcome the project.

CH - Class hours: 0 h.

NCH - Non-class hours: 6 h.

TH - Total hours: 6 h.

RG302 Analyze the intervening variables in the problem and propose actions for a stable situation.

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of memorandums, reports, audiovisual material, etc.
 Relating to projects/POPBLs carried out individually or in teams

5 h.

5 h.

EVALUATION SYSTEM

W

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

100%

Comments: Assesment of the acquired transversal skills:
 Followed methodology to solve the project: team work, decision making methods, conflict management... Project management: Definition of objectives, planning,... Written communication Oral communication

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous assesment. The project is managed through the tutoring meetings and the meetings held with the experts, errors are corrected and the precise guidelines are given to overcome the project.

CH - Class hours: 0 h.

NCH - Non-class hours: 5 h.

TH - Total hours: 5 h.

RG304 Define the problem, develop the solution and present the conclusions in a efficient manner, arguing and justifying each one of them in writing.

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of memorandums, reports, audiovisual material, etc.
 Relating to projects/POPBLs carried out individually or in teams

6 h.

6 h.

EVALUATION SYSTEM

W

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

100%

Comments: Assesment of the acquired transversal skills:
 Followed methodology to solve the project: team work, decision making methods, conflict management... Project management: Definition of objectives, planning,... Written communication Oral communication

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous assesment. The project is managed through the tutoring meetings and the meetings held with the experts, errors are corrected and the precise guidelines are given to overcome the project.

CH - Class hours: 0 h.

NCH - Non-class hours: 6 h.

TH - Total hours: 6 h.

RG305 Define the problem, develop the solution and present the conclusions in a efficient manner, arguing and justifying each one of them in spoken form.

LEARNING ACTIVITIES

CH

NCH

TH

Development, writing and presentation of memorandums, reports, audiovisual material, etc.
 Relating to projects/POPBLs carried out individually or in teams

6 h.

6 h.

EVALUATION SYSTEM

W

Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence

100%

Comments: Assesment of the acquired transversal skills:
 Followed methodology to solve the project: team work, decision making methods, conflict management... Project management: Definition of objectives, planning,... Written communication Oral communication

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous assesment. The project is managed through the tutoring meetings and the meetings held with the experts, errors are corrected and the precise guidelines are given to overcome the project.

CH - Class hours: 0 h.

NCH - Non-class hours: 6 h.

TH - Total hours: 6 h.

RG312 Design and analysis of non controlled AC-DC converters (AC-DC)

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams		5 h.	5 h.
Individual study and work, tests and evaluations and check points	2 h.	4 h.	6 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	14 h.	1 h.	15 h.
Individual or team workshop and/or lab practice	2 h.	1 h.	3 h.
Individual and/or team computer simulation practice	2 h.	3 h.	5 h.

EVALUATION SYSTEM

W

Individual written and oral tests to assess technical skills of the subject	55%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	25%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	20%

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills of the subject

Comments: Continuous assesment of the projects. For that the following will be taken into account: (a) Continuous assesment about the fulfillment of the tasks during the development of the project, both individual and teamwork; (b) In the end of the project, the solution proposed by the students team, as well as the corresponding report; (c) Finally, the oral defense of the project, addressing the acquired knowledge, the quality of the presentation as well as the reasoned justification of the principles and causes of proposing the selected solution.

CH - Class hours: 20 h.

NCH - Non-class hours: 14 h.

TH - Total hours: 34 h.

RG313 Design and analysis of controlled DC-DC and DC-AC converters (DC-DC and DC-AC)

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Development, writing and presentation of memorandums, reports, audiovisual material, etc. Relating to projects/POPBLs carried out individually or in teams		32 h.	32 h.
Presentation of the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	25 h.	25 h.	50 h.
Individual or team workshop and/or lab practice	4 h.	7 h.	11 h.

EVALUATION SYSTEM

W

Individual written and oral tests to assess technical skills of the subject	55%
Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices	10%
Technical skills, involvement in the project, finished work, obtained results, handed documentation, presentation and technical defence	35%

MAKE-UP MECHANISMS

Individual written and oral tests to assess technical skills of the subject

Comments: Continuous assesment of the projects. For that the following will be taken into account: (a) Continuous assesment about the fulfillment of the tasks during the development of the project, both individual and teamwork; (b) In the end of the project, the solution proposed by the students team, as well as the corresponding report; (c) Finally, the oral defense of the project, addressing the acquired knowledge, the quality of the presentation as well as the reasoned justification of the principles and causes of

proposing the selected solution.

CH - Class hours: 29 h.

NCH - Non-class hours: 64 h.

TH - Total hours: 93 h.

CONTENTS

0. Introduction

1. Power analysis.

1.1 DC and steady state.

1.2 One phase and 3 phase.

1.2.1 Sinusoidal and Non sinusoidal.

2. AC/DC converters

2.1 Non controlled converters.

2.1.1 One phase and 3 phase.

3. DC/DC converters

3.1 Non Isolated.

3.2 Isolated.

3.3 Choppers

4. DC/AC converters

4.1 One phase and 3 phase.

4.2 Modulation techniques.(Square wave, PWM…)

SIMULATION WORK

ANALYSIS OF DTHE BEHAVIOUR OF AN OVEN IN DC GRID HOUSE

LAB-WORK

ANALYSIS OF AC-DC ONE PHASE AND 3 PHASE CONVERTERS

ANALYSIS OF DC-DC BUCK AND BOOST CONVERTERS

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Subject notes
Moodle Platform
Class presentations
Programmes
Lab practical training
Slides of the subject

Bibliography

http://katalogoa.mondragon.edu/janium-bin/janium_login_opac_re_Ink.pl?grupo=ENERGIA31&ejecuta=15