

[GCZ301] ELECTRICAL MACHINES AND DRIVES

GENERAL INFORMATION

Studies	DEGREE IN ENGINEERING IN ECO-TECHNOLOGY IN INDUSTRIAL PROCESS		Subject	ELECTRIC AND ELECTRONIC TECHNOLOGY	
Semester	1	Course	2	Mention / Field of specialisation	
Character	COMPULSORY		Language	EUSKARA	
Plan	2022	Modality	Face-to-face	Total hours	[!] 94 class hours + 191 non-class hours = 285 total hours
Credits	6	Hours/week	5.22		

PROFESSORS

EGUREN ALUSTITZA, IMANOL

DOKBE-MORENO LA FUENTE, YERAI

REQUIRED PREVIOUS KNOWLEDGE

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

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GCR208 - To apply the fundamentals of control and electrical machines to the selection of electrical drives		x		5,4
G-RTR1 - To develop interdisciplinary projects specific to their specialty and of gradual complexity, - becoming aware of respect for human rights and fundamental rights, and analyzing and assessing the impact of the proposed solutions on the SDGs - to acquire and/or apply basic, advanced and /or avant-garde, demonstrating the ability to work in multidisciplinary teams and/or undertake further studies with a high degree of autonomy		x		0,32
G-RTR2 - To express information, ideas and the arguments that support them in an orderly, clear and coherent manner, orally and in writing, based on quality information, self-made or obtained from different sources, using inclusive and non-discriminatory language		x		0,28

Total: 6

KC: Knowledge or Content / SK: Skills / AB: Abilities

SECONDARY LEARNING RESULTS

RGC290 [!] *Proponer los objetivos y la planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías propias de su especialidad,- que en ocasiones llegan a la vanguardia del conocimiento- y definir una estrategia de aprendiz*

LEARNING ACTIVITIES

CH NCH TH

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

4 h. 4 h.

EVALUATION SYSTEM

W

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

100%

(No mechanisms)

CH - Class hours: 0 h.

NCH - Non-class hours: 4 h.

TH - Total hours: 4 h.

RGC291 [!] *Establecer las responsabilidades de los miembros del equipo utilizando técnicas adecuadas para fomentar la eficiencia del equipo para el desarrollo del proyecto en los plazos establecidos (compartir recursos, aportar ideas, habilidades comunicativas*

LEARNING ACTIVITIES

CH NCH TH

Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams

4 h. 4 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	100%	(No mechanisms)
CH - Class hours: 0 h. NCH - Non-class hours: 4 h. TH - Total hours: 4 h.		

RGC293 [!] *Redacta y estructura correctamente la memoria del proyecto, haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje. Para ello, busca y hace uso de las fuentes de información adecuadas.*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		4 h.	4 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	(No mechanisms)	
CH - Class hours: 0 h.			
NCH - Non-class hours: 4 h.			
TH - Total hours: 4 h.			

RGC294 [!] *Realiza una presentación oral del proyecto con argumentos elaborados por sí mismos y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		3 h.	3 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree project, master's thesis, challenges and problems	100%	(No mechanisms)	
CH - Class hours: 0 h.			
NCH - Non-class hours: 3 h.			
TH - Total hours: 3 h.			

RGC216 [!] *Entiende el principio de funcionamiento de los transformadores monofásicos y trifásicos y los analiza en régimen permanente*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	9 h.	11 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		9 h.	9 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	4 h.		4 h.

Carrying out exercises and solving problems individually and/or in teams	4 h.	7 h.	11 h.
Practical work in workshops and/or laboratories, individually and/or in teams	4 h.	6 h.	10 h.

EVALUATION SYSTEM

W

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
Individual written and/or oral tests or individual coding/programming tests

20%
80%

MAKE-UP MECHANISMS

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

Individual written and/or oral tests or individual coding/programming tests

Comments: Final mark: Exam mark*0.25 + Retaking mark*0.75

CH - Class hours: 14 h.

NCH - Non-class hours: 31 h.

TH - Total hours: 45 h.

RGC217 [!] *Entiende el principio de funcionamiento de las máquinas de corriente continua y las analiza en régimen permanente*

LEARNING ACTIVITIES

CH

NCH

TH

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

2 h.

4 h.

6 h.

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects

3 h.

3 h.

Carrying out exercises and solving problems individually and/or in teams

3 h.

3 h.

6 h.

EVALUATION SYSTEM

W

Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

100%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests

Comments: Final Mark: Exam*0,25 eta Retaking*0,75

CH - Class hours: 8 h.

NCH - Non-class hours: 7 h.

TH - Total hours: 15 h.

RGC218 [!] *Entiende el principio de funcionamiento de las máquinas de corriente alterna y las analiza en régimen permanente*

LEARNING ACTIVITIES

CH

NCH

TH

Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints

2 h.

13 h.

15 h.

Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams

10 h.

10 h.

Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects

14 h.

14 h.

Carrying out exercises and solving problems individually and/or in teams

4 h.

7 h.

11 h.

EVALUATION SYSTEM

W

Individual written and/or oral tests or individual coding/programming tests

100%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 20 h.

NCH - Non-class hours: 30 h.

TH - Total hours: 50 h.

RGC219 [!] *Diseña y sintoniza los lazos de control para la regulación de velocidad en máquinas eléctricas*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		15 h.	15 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	2 h.		2 h.
Carrying out exercises and solving problems individually and/or in teams	3 h.	5 h.	8 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	

CH - Class hours: 5 h.
NCH - Non-class hours: 20 h.
TH - Total hours: 25 h.

RGC216 [!] *Entiende el principio de funcionamiento de los transformadores monofásicos y trifásicos y los analiza en régimen permanente*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	9 h.	11 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		9 h.	9 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	4 h.		4 h.
Carrying out exercises and solving problems individually and/or in teams	4 h.	7 h.	11 h.
Practical work in workshops and/or laboratories, individually and/or in teams	4 h.	6 h.	10 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	20%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	
Individual written and/or oral tests or individual coding/programming tests	80%	Individual written and/or oral tests or individual coding/programming tests	
Comments: Final mark: Exam mark*0.25 + Retaking mark*0.75			

CH - Class hours: 14 h.
NCH - Non-class hours: 31 h.
TH - Total hours: 45 h.

RGC217 [!] *Entiende el principio de funcionamiento de las máquinas de corriente continua y las analiza en régimen permanente*

LEARNING ACTIVITIES	CH	NCH	TH
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams	2 h.	4 h.	6 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	3 h.		3 h.
Carrying out exercises and solving problems individually and/or in teams	3 h.	3 h.	6 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Individual written and/or oral tests or individual coding/programming tests	
Comments: Final Mark: Exam*0,25 eta Retaking*0,75			

CH - Class hours: 8 h.
NCH - Non-class hours: 7 h.

TH - Total hours: 15 h.

RGC218 [!] *Entiende el principio de funcionamiento de las máquinas de corriente alterna y las analiza en régimen permanente*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	13 h.	15 h.
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		10 h.	10 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	14 h.		14 h.
Carrying out exercises and solving problems individually and/or in teams	4 h.	7 h.	11 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests	

CH - Class hours: 20 h.

NCH - Non-class hours: 30 h.

TH - Total hours: 50 h.

RGC219 [!] *Diseña y sintoniza los lazos de control para la regulación de velocidad en máquinas eléctricas*

LEARNING ACTIVITIES	CH	NCH	TH
Development and writing of records, reports, presentations, audiovisual material, etc. on projects/work experience/challenges/case studies/experimental investigations carried out individually and/or in teams		15 h.	15 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	2 h.		2 h.
Carrying out exercises and solving problems individually and/or in teams	3 h.	5 h.	8 h.
EVALUATION SYSTEM	W	MAKE-UP MECHANISMS	
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	

CH - Class hours: 5 h.

NCH - Non-class hours: 20 h.

TH - Total hours: 25 h.

CONTENTS

1. REVIEW OF ALTERNATING CURRENT2. THREE-PHASE ALTERNATING CURRENT3. FUNDAMENTALS OF MAGNETISM4. TRANSFORMERS- Single-phase transformers- Characterisation of Transformers- Three-phase transformers- Practice of Transformers

5. ASYNCHRONOUS MACHINES- Basis of Operation- Types of Machines- Characterisation- Steady State Analysis

6. SYNCHRONOUS ALTERNATORS- Basis of operation- Characterisation- Permanent Regime- Alternators Associated to the Grid/Alternators operating alone- Characterisation of a synchronous machine

7. DIRECT CURRENT MACHINES- Basis of Operation- Types of machines- Characterisation- Steady State Analysis

s- Speed control8. REGULATION- Basic controllers- Dynamic behaviour of systems- Modelling and control of DC electrical machines- Regulation simulations/exercises

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Labs
Subject notes
Moodle Platform
Class presentations

Bibliography

Fraile Mora, J. (2015) Máquinas eléctricas. Libro. 8ª ed. Garceta
Fraile Mora, J., & Fraile Ardanuy, J. (2015). Problemas de máquinas eléctricas. Garceta.