

[GMI301] ELECTRICAL DRIVE TECHNOLOGIES

GENERAL INFORMATION

Studies	DEGREE IN MECHANICAL ENGINEERING	Subject	?
Semester	1	Course	3
Character	COMPULSORY	Mention / Field of specialisation	
Plan	2022	Modality	Face-to-face
Credits	3	Language	EUSKARA/CASTELLANO/ENGLISH
		Hours/week	2.22
		Total hours	40 class hours + 35 non-class hours = 75 total hours

2030 AGENDA GOALS



PROFESSORS

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REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
(No specific previous subjects required)	Basic knowledge of Electrical Physics

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GMR301 - To know and use the principles of circuit theory and electrical machines		x		2,56
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		0,2
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		0,24
Total:				3

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

ENAEF LEARNING RESULTS

- ENA102** - Knowledge and comprehension: Knowledge and comprehension of the engineering disciplines of their speciality, at the level necessary to acquire the rest of the competencies of the degree, including notions of the latest advances.
- ENA103** - Knowledge and comprehension: Awareness of the multidisciplinary context of engineering.
- ENA104** - Analysis in engineering: The ability to analyse complex products, processes and systems in their field of study; choose and apply relevant analytical, calculation and experimental methods in a suitable way; and correctly interpret the results of such analyses.
- ENA105** - Analysis in engineering: The ability to identify, formulate and solve engineering problems in their speciality; choose and apply adequately established analytical, calculation and experimental methods; and acknowledge the importance of social, health and safety, environmental, economic, and industrial restrictions.
- ENA106** - Engineering projects: Ability to project, design and develop complex products (parts, components, finished products, etc.), processes and systems of their speciality, which meet the established requirements, including awareness of the social, health and safety, environmental, economic and industrial aspects, as well as selecting and applying appropriate project methods.
- ENA107** - Engineering projects: Project capacity some state-of-the-art knowledge of their engineering speciality.
- ENA108** - Research and innovation: Ability to carry out bibliographic searches and consult and use databases and other information sources with discretion, in order to carry out simulation and analysis with the aim of conducting research on technical topics of their speciality.
- ENA111** - Practical application of engineering: Understanding of the applicable techniques and methods for analysis, design and research and their limitations in the field of their speciality.
- ENA113** - Practical application of engineering: Knowledge of application of materials, equipment and tools, engineering technology and processes, and their limitations in the field of their speciality.
- ENA115** - Practical application of engineering: Knowledge of the social, health and safety, environmental, economic and industrial implications of engineering practice.
- ENA118** - Preparation of judgements: Ability to manage complex technical or professional activities or projects of their speciality, taking responsibility for decision making.
- ENA119** - Communication and Teamwork: Ability to effectively communicate information, ideas, problems and solutions in the field of engineering and with society in general.
- ENA120** - Communication and Teamwork: Ability to operate effectively in domestic and international contexts, individually and as a team, and to cooperate with both engineers and people from other disciplines.
- ENA121** - Continued training: Ability to acknowledge the need for their own continued training and to undertake this activity throughout their professional life independently.
- ENA122** - Continued training: Ability to stay up to date on science and technology innovations.

SECONDARY LEARNING RESULTS

1RGM392 (1 sem)

LEARNING ACTIVITIES

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

CH

NCH

TH

1 h.

1 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

(No mechanisms)

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings.

Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.

CH - Class hours: 0 h.

NCH - Non-class hours: 1 h.

TH - Total hours: 1 h.

RGM304 [I] Conocer y aplicar los criterios de dimensionamiento de accionamientos

LEARNING ACTIVITIES

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

CH

NCH

TH

4 h.

4 h.

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

8 h.

5 h.

13 h.

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

10 h.

10 h.

20 h.

EVALUATION SYSTEM

W

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

32%

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

68%

MAKE-UP MECHANISMS

(No mechanisms)

Comments: In the Retake of the single check point, the mark will be obtained as: $0.25 \times \text{The note of the 1st Check Point} + 0.75 \times \text{The mark of the Retake C.Point POPBL Project Recovery}$: Continuous evaluation and feedback

Comments: There will only be one Check Point. Final Mark = $0.68 \times \text{C.Point} + 0.32 \times \text{POPBL Technical competence}$: Students have the responsibility of meeting the experts to do the tracking of the project and to ensure the achievement of the goals.

CH - Class hours: 18 h.

NCH - Non-class hours: 19 h.

TH - Total hours: 37 h.

1RGM391 (1 sem)

LEARNING ACTIVITIES

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

CH

NCH

TH

1 h.

1 h.

2 h.

EVALUATION SYSTEM

W

Self-assessment

50%

Observation (technical capacity, attitude and participation)

50%

MAKE-UP MECHANISMS

(No mechanisms)

Comments: The average of the marks of the tutor's assessment and the self-assessment carried out by the work team is calculated, using the defined rubrics. Afterwards, the final mark is calculated taking into account the co-evaluation among the members of the

team.

CH - Class hours: 1 h.

NCH - Non-class hours: 1 h.

TH - Total hours: 2 h.

1RGM394 (1 sem)

LEARNING ACTIVITIES

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

CH

1 h.

NCH

2 h.

TH

3 h.

EVALUATION SYSTEM

W

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%

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings.

Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.

CH - Class hours: 1 h.

NCH - Non-class hours: 2 h.

TH - Total hours: 3 h.

1RGM390 (1 sem)

LEARNING ACTIVITIES

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

CH

1 h.

NCH

1 h.

TH

2 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

(No mechanisms)

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings.

CH - Class hours: 1 h.

NCH - Non-class hours: 1 h.

TH - Total hours: 2 h.

RGM301 [I] Conocer diferentes tipos de máquinas eléctricas y elegir el motor apropiado para aplicaciones industriales

LEARNING ACTIVITIES

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

CH

7 h.

NCH

3 h.

TH

3 h.

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

7 h.

7 h.

EVALUATION SYSTEM

W

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

20,4%

Presentation and defence of exercises, case studies,

32%

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

computer practical work, simulation practical work,
laboratory practical work, term projects, end of degree
project, master's thesis, challenges and problems

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

47,6%

Comments: A Team Work entitled "Industrial Application vs. Engine Families" will be requested. In the individual tests a single checkpoint will be performed. The grade will be calculated as follows: $(0.7 \cdot KP1 + 0.3 \cdot TLana) \cdot 0.68 + POPBL5 \cdot 0.32$ Technical competence: Students have the responsibility of meeting the experts to do the tracking of the project and to ensure the achievement of the goals.

CH - Class hours: 7 h.

NCH - Non-class hours: 3 h.

TH - Total hours: 10 h.

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

Comments: Teamwork called "Industrial Applications vs Motor Families" is not recoverable. With the retake of a single point of control, the theoretical mark will be: $0.25 \cdot$ The mark of the point of control $+0.75 \cdot$ The mark of the point of control of recovery. Semester project Retake: Continuous evaluation and feedback

1RGM393 (1 sem)

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

1 h.

2 h.

3 h.

EVALUATION SYSTEM

W

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

100%

Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Continuous evaluation. FEEDBACK received from the tutor and the experts in the project follow-up meetings.

CH - Class hours: 1 h.

NCH - Non-class hours: 2 h.

TH - Total hours: 3 h.

RGM302 [!] Describir los principios de funcionamiento de máquinas eléctricas

LEARNING ACTIVITIES

CH

NCH

TH

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

2 h.

2 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

2 h.

2 h.

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

5 h.

2 h.

7 h.

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

4 h.

2 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

36%

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

10%

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

54%

Comments: In the individual tests, only one examination point shall be taken. The final mark will be calculated as follows: $(0.6 \cdot KP1 + 0.3 \cdot Q1 + 0.1 \cdot Q0) \cdot 0.9 + POPBL5 \cdot 0.1$ Q0: Basic electricity

MAKE-UP MECHANISMS

(No mechanisms)

Comments: Q0 and Q1 questionnaires have no recovery option. With the reatke of a single point of control, the theoretical mark will be: $0.25 \cdot$ The note of the 1st Check Point $+0.75 \cdot$ The mark of the Retake. Semestre Project Recovery: Continuous evaluation and feedback

questionnaire. Students have the responsibility of meeting the experts to do the tracking of the project and to ensure the achievement of the goals.

CH - Class hours: 11 h.

NCH - Non-class hours: 6 h.

TH - Total hours: 17 h.

CONTENTS

1. Presentation of the subject

1. AC and DC circuits. Electromagnetic interaction.

2. Electric actuators torque and rotation generation: DC motor principle.

3. Asynchronous motors

1. Main characteristics: rotary flow, sliding, connection terminals ...
2. Curves/graphs of work, problem of direct start.
3. Protection elements.
4. Basics on Power electronics: diodes and Thyristors. Rectifiers
5. Power schemes: direct start, change of direction, star-delta start
6. Modification of speed: Variable frequency drivers ...
7. Motor selection: exercises

4. Servo drives: AC servo motors.

1. General characteristics
2. Control loops
3. Motor selection: exercises

5. Analysis of various industrial applications and the selection of drives for them

6- European regulations to improve the efficiency of electric drives

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Moodle Platform
Slides of the subject
Topic related web quires
Lab practical training

Bibliography

Accionamientos eléctricos. Tomo 1 y2 Merino Azcárraga, José María.
Industrial brushless servomotors Moreton, Peter, 2000
Control de motores eléctricos Enriquez Harper, Gilberto 1999
Electrical machines, drives, and power systems;Theodore Wildi, Prentice Hall.
Electric machinery and power system fundamentals”; S.J.Chapman, McGraw Hill,
Electric Motors and Drives: fundamentals, types and applications; A.Hughes and B.Drury, Elsevier, 2013 4th edition