

[GJC104] FOUNDATIONS OF ELECTRICAL ENGINEERING

GENERAL INFORMATION

Studies	DEGREE IN MECHATRONICS ENGINEERING		Subject	?
Semester	1	Course	2	Mention / Field of specialisation
Character	OPTIONAL		Language	CASTELLANO/EUSKARA
Plan	2020	Modality	Face-to-face	Total hours
Credits	6	Hours/week	5	90 class hours + 60 non-class hours = 150 total hours

PROFESSORS

CANALES SEGADE, JOSE MARIA

 CABEZUELO ROMERO, DAVID

REQUIRED PREVIOUS KNOWLEDGE

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

SKILLS

VERIFICA SKILLS

SPECIFIC

GJCE02 - To understand and master basic concepts from the general laws of mechanics, thermodynamics, fields and waves and electromagnetism, applying them to engineering problems.

GENERAL

GJCG03 - Addressing and optimising activities of assembly, commissioning, assistance and maintenance of facilities, machinery, and industrial mechatronic systems

CROSS

GJCTR2 - To be able to understand and apply knowledge to problem solving in complex work situations or specialised and professional environments calling for creative and innovative ideas, using self-developed arguments and procedures;

BASIC

G_CB5 - To have developed learning abilities required to embark on subsequent studies with a high level of autonomy.

LEARNING RESULTS

RG201 They coordinate their work with the other members of the team, contribute in their team to the development of the tasks to be carried out and the creation of a good working climate.

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.	2 h.	4 h.

EVALUATION SYSTEM

	W
Self-assessment	30%
Co-assessment	35%
Observation (technical capacity, attitude and participation)	35%

MAKE-UP MECHANISMS

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

Comments: With the project of the second semester

CH - Class hours: 2 h.

NCH - Non-class hours: 2 h.

TH - Total hours: 4 h.

RG202 They make decisions and assess the possible consequences of the selected alternative.

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	3 h.	1 h.	4 h.

EVALUATION SYSTEM

	W
Observation (technical capacity, attitude and participation)	100%

MAKE-UP MECHANISMS

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

Comments: With the project of the second semester

CH - Class hours: 3 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 4 h.

RG204 They define the problem, the development of the solution, as well as the conclusions in an effective way, making a correct use of the language, in writing.

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	NCH	TH
2 h.	2 h.	4 h.

EVALUATION SYSTEM

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

W

100%

MAKE-UP MECHANISMS

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

Comments: Revision and correction of the written report of the semester project

CH - Class hours: 2 h.
NCH - Non-class hours: 2 h.
TH - Total hours: 4 h.

RG205 They define the problem, the development of the solution, as well as the conclusions in an effective way, making a correct use of the language, orally.

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	NCH	TH
3 h.		3 h.

EVALUATION SYSTEM

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

W

100%

MAKE-UP MECHANISMS

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

Comments: With the oral presentation of the project of the second semester

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

RG2036 [!] *Identifica, examina y calcula la oscilación y los fenómenos de onda*

LEARNING ACTIVITIES

Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.	3 h.	5 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.	1 h.	3 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	6 h.		6 h.
Carrying out exercises and solving problems individually and/or in teams	4 h.	7 h.	11 h.

CH

NCH

TH

Seminars, debates and/or workshops to deepen and/or share experiences.

2 h.

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

Reports of solving exercises, case studies, computer practices, simulation practices and laboratory practices

Comments: Correction and re-delivery of the document

CH - Class hours: 16 h.

NCH - Non-class hours: 11 h.

TH - Total hours: 27 h.

RG2037 [!] *Resuelve los problemas y las operaciones en el campo del electromagnetismo, relacionando correctamente las magnitudes físicas implicadas*

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

8 h.

7 h.

15 h.

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

2 h.

8 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

8 h.

7 h.

15 h.

EVALUATION SYSTEM

W

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

10%

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

90%

MAKE-UP MECHANISMS

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

Comments: Final mark: written second-chance exam (75%) + exam (25%). Laboratory practices and autoevaluations will be made-up by on-going evaluation

CH - Class hours: 32 h.

NCH - Non-class hours: 22 h.

TH - Total hours: 54 h.

RG2038 [!] *Analiza y resuelve los circuitos de corriente continua y la corriente alterna*

LEARNING ACTIVITIES

CH

NCH

TH

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

3 h.

6 h.

9 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

4 h.

4 h.

8 h.

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

11 h.

11 h.

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

9 h.

12 h.

21 h.

Practical work in workshops and/or laboratories, individually and/or in teams

5 h.

5 h.

EVALUATION SYSTEM

W

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

10%

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

90%

MAKE-UP MECHANISMS

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

Comments: Final mark: written second-chance exam (75%) + exam (25%). Laboratory practices and autoevaluations will be made-up by on-going evaluation

CH - Class hours: 32 h.

NCH - Non-class hours: 22 h.

TH - Total hours: 54 h.

CONTENTS

1. Electrostatic

Electric charge. Coulomb's Law
Electric field and flux: Gauss' Law
Electrostatic energie. Electric potential
Electrostatic energy storage: Capacitances

2. Direct current circuits

Electric circuit and electrical variables: voltage, current
Resistance. Ohm's Law
Joule's effect. Electric power
Simple direct current circuits
Resolution of complex DC circuits: Kirchhoff's Laws, the theorem of Thévenin, Principal of superposition

3. Waves and oscillation phenomena

Sine wave form and its parameters

Harmonics

4. Alternating current circuits

AC single-phase mains
Analysis of simple alternating current circuits in a permanent regime
Complex impedance. Phasors and vectorial diagrams
Resolution of alternating current circuits by complex numbers
Active, reactive and apparent power. Power factor
Power factor correction

5. Electromagnetism

Magnetic field and the electric current: Biot and Savart's law.
Magnetic flux and flux density
Magnetic circuits
Electromagnetic induction: Faradays law
Magnetic energy storage: Inductance

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Moodle Platform
Lab practical training
Slides of the subject

Bibliography

F.W. Sears, M.W. Zemansky, H.D. Young, R.A. Freedman. Física Universitaria (2º vol.). 13ª ed. México: Pearson Ed. 2013. ISBN:978-607-322-190-0
Joseph A. Edminister, Mahmood Nahvi. Circuitos eléctricos. Mc Graw Hill
P.A. Tipler, G. Mosca. Física para la ciencia y la tecnología (2º vol.). Barcelona:Reverté. 2010. ISBN: 978-84-291-4433-8
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