

[GMI302] AUTOMATION OF MACHINES AND PROCESSES

GENERAL INFORMATION

Studies	DEGREE IN MECHANICAL ENGINEERING		Subject	?
Semester	2	Course	3	Mention / Field of specialisation
Character	COMPULSORY		Language	CASTELLANO/EUSKARA
Plan	2022	Modality	Face-to-face	Total hours
Credits	4,5	Hours/week	3.44	62 class hours + 50.5 non-class hours = 112.5 total hours

PROFESSORS

BARRUTIA SARASUA, HARITZ
AZPI-BARANDIARAN MUNDUATE, JOSEBA (GOIERRI)
FERNANDEZ DE GOBEO DIAZ DE DURANA, ANDER

REQUIRED PREVIOUS KNOWLEDGE

Subjects	Knowledge
PHYSICS II	(No previous knowledge required)
ELECTRICAL DRIVE TECHNOLOGIES	

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GMR303 - To know the fundamentals of automation and control methods	x			3,78
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		0,4
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		0,32
Total:				4,5

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

ENAE 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.
- 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.
- ENA122** - Continued training: Ability to stay up to date on science and technology innovations.

SECONDARY LEARNING RESULTS

RGM390 [!] *Definir y gestionar los objetivos y la planificación de un proyecto que le permita adquirir y/o reforzar los conocimientos de tecnologías específicas de su especialidad,- que en ocasiones llegan a la vanguardia del conocimiento- y definir una estrate*

LEARNING ACTIVITIES		<i>CH</i>	<i>NCH</i>	<i>TH</i>
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		1 h.	3 h.	4 h.
EVALUATION SYSTEM	<i>W</i>	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		
Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.		Comments: Continuous evaluation. FEEDBACK received from the tutor in the semester project follow-up meetings.		
CH - Class hours: 1 h. NCH - Non-class hours: 3 h. TH - Total hours: 4 h.				

RGM391 [!] *Coordinar el equipo de trabajo, estimulando la cohesión y buen clima para lograr la integración de todas las personas y su contribución para alcanzar un rendimiento apropiado, tanto a nivel individual como grupal, para el desarrollo del proyecto en*

LEARNING ACTIVITIES		<i>CH</i>	<i>NCH</i>	<i>TH</i>
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		1 h.	2 h.	3 h.
EVALUATION SYSTEM	<i>W</i>	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		
Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals. 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 by multiplying that average mark by a factor calculated on the basis of the co-evaluation among the members of the group.		Comments: Continuous evaluation. FEEDBACK received from the tutor in the semester project follow-up meetings.		
CH - Class hours: 1 h. NCH - Non-class hours: 2 h. TH - Total hours: 3 h.				

RGM392 [!] *Identificar y argumentar de forma precisa los ODS en los que incide el proyecto realizado, aportando posibles acciones para la mejora.*

LEARNING ACTIVITIES		<i>CH</i>	<i>NCH</i>	<i>TH</i>
Carrying out/resolving projects/challenges/cases, etc. to provide solutions to problems in interdisciplinary contexts, real and/or simulated, individually and/or in teams		1 h.	2 h.	3 h.
EVALUATION SYSTEM	<i>W</i>	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		
Comments: Students have the responsibility of meeting the tutor to do the tracking of the project and to ensure the achievement of the goals.		Comments: Continuous evaluation. FEEDBACK received from the tutor in the semester project follow-up meetings.		
CH - Class hours: 1 h. NCH - Non-class hours: 2 h. TH - Total hours: 3 h.				

RGM393 [!] *Elabora la memoria del proyecto, aportando argumentos elaborados y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
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.	3 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%

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

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

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

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

RGM394 [!] *Realiza una presentación oral del proyecto, justificando las soluciones propuestas con argumentos elaborados y precisos, y haciendo un uso correcto, inclusivo y no discriminatorio del lenguaje.*

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
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.	3 h.	4 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%

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

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

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

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

RGM307 [!] *Conocer los tipos de sensores utilizados para la automatización de procesos industriales y comprender sus inicios de funcionamiento*

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3 h.		3 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.	6 h.	16 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	5 h.		5 h.
Practical work in workshops and/or laboratories, individually and/or in teams	1 h.		1 h.

EVALUATION SYSTEM

Reports on the completion of exercises, case studies,

W

17%

MAKE-UP MECHANISMS

Individual written and/or oral tests or individual

computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems		coding/programming tests
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	31%	Comments: POPBL Project Recovery: Continuous evaluation and feedback. With the recovery of a single point of control, the theoretical note will be: 0.25* The note of the point of control +0.75* The note of the point of control of recovery.
Individual written and/or oral tests or individual coding/programming tests	49%	
Self-assessment	3%	
Comments: The control points are distributed as follows: KP1: sensor checkpoint, 39 %. KP2: Controller control point 10 %. A laboratory practice will be carried out and a technical report must be handed in, which has a weight of 11 % of the mark. Self-assessment: It is necessary to watch the videos published in Mudle and answer correctly to the questions posed. 100 % of the answers must be correct in order to pass the learning outcome.		
CH - Class hours: 19 h. NCH - Non-class hours: 6 h. TH - Total hours: 25 h.		

RGM308 [!] *Conocer las metodologías GRAFCET/GEMMA y saber definir el ciclo de trabajo de una instalación automatizada utilizando la más adecuada*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3 h.		3 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.	3,5 h.	7,5 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	8 h.	7 h.	15 h.
Carrying out exercises and solving problems individually and/or in teams	6 h.	5 h.	11 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	50%	<i>(No mechanisms)</i>	
Individual written and/or oral tests or individual coding/programming tests	50%	Comments: POPBL Project Recovery: Continuous evaluation and feedback. With the recovery of a single point of control, the theoretical note will be: 0.25* The note of the point of control +0.75* The note of the point of control of recovery.	
CH - Class hours: 21 h. NCH - Non-class hours: 15,5 h. TH - Total hours: 36,5 h.			

RGM309 [!] *Desarrolla un programa que controla un sistema automático basado en controlador PLC.*

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	1 h.	7 h.	8 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	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	50%	Individual written and/or oral tests or individual coding/programming tests	
Individual written and/or oral tests or individual coding/programming tests	50%	Comments: POPBL Project Recovery: Continuous evaluation and feedback. With the recovery of a single point of control, the theoretical note will be: 0.25* The note of the point of control +0.75* The note of the point of control of recovery.	

CH - Class hours: 10 h.
NCH - Non-class hours: 10 h.
TH - Total hours: 20 h.

RGM336 [!] *Comprender la estructura de un sistema automatizado e identificar la función de cada componente*

LEARNING ACTIVITIES

	<i>CH</i>	<i>NCH</i>	<i>TH</i>
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning	1 h.		1 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.	4 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	2 h.	2 h.	4 h.
Carrying out exercises and solving problems individually and/or in teams	2 h.	2 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

18%

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

57%

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

Comments: The check points are two: KP1: Sensor Section Check Point 27% and KP2: Controller Section Check Point 30%

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

Comments: The criterion for calculating the CP note after retake: 25% first CP+ 75% second CP

CH - Class hours: 7 h.
NCH - Non-class hours: 6 h.
TH - Total hours: 13 h.

CONTENTS

1.- Industrial Automation 1.1.- Course presentation 1.2.- Introduction to Industrial Automation 1.2.- Levels of automation 1.3.- Examples 2.- Industrial Automation Elements 2.1.- Sensors: Internal Elements 2.1.1.- Classifications 2.1.2.- Dynamic and static characteristics 2.1.3.- Proximity detectors 2.1.4.- Position sensors 2.1.5.- Temperature Detectors 2.2.- Types of industrial control: closed loop and open loop 2.3.- Industrial controllers: generalities and examples. 2.4.- Programmable Logic Controllers 2.4.1.- General characteristics 2.4.2.- Special PLC Modules 2.4.3.- Grafset Methodology to program PLC. Safety by means of Grafset

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Bibliography

Moodle Platform
 Lab practical training
 Slides of the subject
 Class presentations

Sensors and transducers [Libro] / Ian R. Sinclair Oxford Boston : Elsevier , 2001- ISBN: 9780750649322
 Sensors and actuators A, Physical [Revista] : an international journal devoted to research and development of physical transducers. ISSN0924-4247
 Sensor technology handbook [Book] / editor-in-chief, Jon S. Wilson. Amsterdam Boston : Elsevier , 2005. ISBN 9780750677295
 Enrique Mandado, J.Marcos Acevedo: Autómatas programables Entorno y aplicaciones, 2005, ISBN 84-9732-328-9
 Ingeniería de la AUTOMATIZACIÓN INDUSTRIAL. 2ª edición

ampliada y actualizada. Ramón Piedrafita Moreno. 2004 ISBN:
84-7897-604-3

<https://industrial.omron.es/es/products/sensing> [7/01/2024an
kontsultatua]

<https://industrial.omron.es/es/products/programmable-logic-controllers>
[2024/01/07an kontsultatua]

<https://www.youtube.com/@automatizacionindustrial> [2024/01/07an
kontsultatua]

https://www.google.com/url?sa=t&rct=j&q=&esrc=s&source=web&cd=&ved=2ahUKEwjRxrKz3MuDaxWBU6QEHQPhAUoQFnoECBEQAQ&url=https%3A%2F%2Fwww.sick.com%2Fmedia%2Fdocs%2F6%2F16%2F916%2FProduct_catalog_SICK_Essentials_Core_Product_Selection_Distribution_Catalog_es_IM0044916.PDF&usg=AOvVaw0pO4yMI-LfmeODK0AFilAj&opi=89978449 [2024/01/07an
kontsultatua] SICK sentsore katalogoa