Goi Eskola Politeknikoa | Mondragon Unibertsitatea
Course: 2024 / 2025 - Course planning

Mondragon Unibertsitatea / Goi Eskola Politeknikoa / Escuela Politécnica Superior

[MMC102] AUTOMATION OF BIOMEDICAL SYSTEMS

GENERAL INFORMATION

Studies	MASTER'S DEGREE IN BIOMEDICAL TECHNOLOGIES	**Subject**	?
Semester 2	**Course** 1	**Mention / Field of specialisation**	
Character COMPULSORY			
Plan 2023	**Modality** Face-to-face	**Language**	CASTELLANO
Credits 4,5	**Hours/week** 3.4	**Total hours**	61.2 class hours + 51.3 non-class hours = **112.5 total hours**

PROFESSORS

AZKARATE FERNANDEZ, IGOR

REQUIRED PREVIOUS KNOWLEDGE

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

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
MMRA09 - To integrate automation and control solutions for biomedical systems		x		3,16
MMR-26 - To apply the knowledge acquired and your problem-solving skills in new, little-known or changing environments within broader (or multidisciplinary) contexts related to your area of study		x		1,08
MMR-28 - To communicate your conclusions and the knowledge and ultimate reasons that support them to specialized and non-specialized audiences in a clear and unambiguous way		x		0,26
			Total:	**4,5**

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

SECONDARY LEARNING RESULTS

RMM119 [!] *Conocer e identificar los sensores y actuadores necesarios para la automatización de sistemas biomédicos*

LEARNING ACTIVITIES	CH	NCH	TH
Computer simulation exercises, 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	4 h.		4 h.
Practical work in workshops and/or laboratories, individually and/or in teams	8 h.	2,3 h.	10,3 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%	Observation (technical capacity, attitude and participation)

CH - Class hours: 16 h.
NCH - Non-class hours: 6,3 h.
TH - Total hours: 22,3 h.

RMM120 [!] *Modelar el sistema biomédico y desarrollar el proceso de automatización*

LEARNING ACTIVITIES	CH	NCH	TH
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Computer simulation exercises, individually and/or in teams	6 h.	18 h.	24 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	8 h.		8 h.
Practical work in workshops and/or laboratories, individually and/or in teams	8 h.	14,7 h.	22,7 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Presentation and defence of exercises, case studies, computer practical work, simulation practical work,	50%	Individual written and/or oral tests or individual coding/programming tests

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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	50%

Comments: If the score of the exam is lower than 4, this evaluation item will be evaluated in its entirety (%100) with the score of the exam.

Observation (technical capacity, attitude and participation)
Comments: If the score of the exam is lower than 5, it will be mandatory to repeat the exam

CH - Class hours: 24 h.
NCH - Non-class hours: 32,7 h.
TH - Total hours: 56,7 h.

RMM147 [!] *Define los objetivos, realiza la planificación para su consecución y su seguimiento sistemático coordinando su trabajo con los demás miembros del equipo.*

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	2 h.	1 h.	3 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%	Observation (technical capacity, attitude and participation)
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	50%	

CH - Class hours: 2 h.
NCH - Non-class hours: 1 h.
TH - Total hours: 3 h.

RMM145 [!] *Conoce y es capaz de aplicar las herramientas de resolución de problemas en el campo de la Ingeniería Biomédica con iniciativa, toma de decisiones, creatividad y razonamiento crítico.*

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	8,5 h.	5 h.	13,5 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	40%	Observation (technical capacity, attitude and participation)
Co-assessment	5%	
Prototype / Product	55%	

Comments: If the score of the defense is lower than 5, this evaluation item will be evaluated in its entirety (%100) with the score of the defense. A co-evaluation system will be implemented to adjust the score of the student based on his or her participation in the Project.

CH - Class hours: 8,5 h.
NCH - Non-class hours: 5 h.
TH - Total hours: 13,5 h.

RMM144 [!] *Analiza las variables intervinientes en la solución de los problemas y plantea acciones para lograr una situación*

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estable asumiendo responsabilidades en el equipo de trabajo, afrontando contingencias y organizando y planificando tareas.

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	8,5 h.	5 h.	13,5 h.

EVALUATION SYSTEM

	W
Individual written and/or oral tests or individual coding/programming tests	40%
Co-assessment	5%
Prototype / Product	55%

Comments: If the score of the defense is lower than 5, this evaluation item will be evaluated in its entirety (%100) with the score of the defense. A co-evaluation system will be implemented to adjust the score of the student based on his or her participation in the Project.

MAKE-UP MECHANISMS

Observation (technical capacity, attitude and participation)

CH - Class hours: 8,5 h.
NCH - Non-class hours: 5 h.
TH - Total hours: 13,5 h.

RMM146 [!] *Define el problema, el desarrollo de la solución, así como las conclusiones de manera eficaz, argumentando y justificando cada una de ellas, y haciendo un uso correcto del lenguaje, por escrito y de manera oral.*

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	2,2 h.	1,3 h.	3,5 h.

EVALUATION SYSTEM

	W
Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems	50%
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	50%

MAKE-UP MECHANISMS

Observation (technical capacity, attitude and participation)

CH - Class hours: 2,2 h.
NCH - Non-class hours: 1,3 h.
TH - Total hours: 3,5 h.

CONTENTS

1. Modelling and implementation of automated systems.

1.1. Sequential systems.

1.2. Modelling of sequential systems. GRAFCET methodology.

1.3. Implementation in PLC.

1.4. Virtual commissioning.

2. Sensors and actuators.

2.1. Overview.

2.2. Selection.

2.3. PLC connection.

2.4. Programming

3. Development of an automated solution.

LEARNING RESOURCES AND BIBLIOGRAPHY	
Learning resources	**Bibliography**
Subject notes Moodle Platform Computer practical training Lab practical training	Biomedical Sensors and Instruments. Second Edition. Tatsuo Togawa, Toshiyo Tamura, P. Ake Öberg. Handbook of Automation. Yukio Hasegawa et al. Biomedical Engineering Handbook. J.D. Bronzino. Introduction to Biomedical Engineering. Third Edition. John D. Enderle, Joseph D. Bronzino.