Goi Eskola Politeknikoa | Mondragon Unibertsitatea
Course: 2023 / 2024 - Course planning

Mondragon Unibertsitatea
Goi Eskola Politeknikoa
Escuela Politécnica Superior

[GBI201] BIOMEDICAL SIGNAL PROCESSING AND CONTROL

GENERAL INFORMATION

Studies	DEGREE IN BIOMEDICAL ENGINEERING	**Subject**	SIGNAL PROCESSING
Semester	2	**Course** 2	
Character	COMPULSORY	**Mention / Field of specialisation**	
Plan	2022	**Modality** Face-to-face	**Language** EUSKARA
Credits	4,5	**Hours/week** 3.92	**Total hours** 70.5 class hours + 42 non-class hours = **112.5 total hours**

PROFESSORS

MUXIKA OLASAGASTI, EÑAUT

ANTIA JUARISTI, ANE

REQUIRED PREVIOUS KNOWLEDGE

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

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GBR211 - To develop systems for the acquisition of biomedical signals		x		4,02
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		0,24
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:	**4,5**

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

SECONDARY LEARNING RESULTS

RGB290 [!] *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 estrategía 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	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	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

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

RGB291 [!] *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	2 h.	1 h.	3 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS

Self-assessment	25%	Prototype / Product
Co-assessment	25%	
Observation (technical capacity, attitude and participation)	50%	

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

RGB293 [!] *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	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	100%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems

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

RGB294 [!] *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	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	100%	Observation (technical capacity, attitude and participation)

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

RGB236 [!] *Acondicionamiento, amplificación y filtrado mediante filtros activos (utilizando técnicas basadas en el dominio de la frecuencia) de señales biomédicas conociendo su configuración y características*

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	9 h.	6 h.	15 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	3 h.		3 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	11,5 h.	7 h.	18,5 h.
Carrying out exercises and solving problems individually and/or in teams	9 h.	6,5 h.	15,5 h.

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Practical work in workshops and/or laboratories, individually and/or in teams	5 h.	3 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	25%	Individual written and/or oral tests or individual coding/programming tests
Individual written and/or oral tests or individual coding/programming tests	75%	

CH - Class hours: 37,5 h.
NCH - Non-class hours: 22,5 h.
TH - Total hours: 60 h.

RGB237 **[!]** *Conoce las características principales de señales y sensores biomédicos, así como los sistemas necesarios para el correcto funcionamiento de los biosensores*

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	,5 h.	3,5 h.	4 h.
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning	5 h.		5 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints	2 h.		2 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	7,5 h.	2 h.	9,5 h.
Carrying out exercises and solving problems individually and/or in teams	5 h.	10 h.	15 h.
Practical work in workshops and/or laboratories, individually and/or in teams	5 h.		5 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	10%	Individual written and/or oral tests or individual coding/programming tests
Individual written and/or oral tests or individual coding/programming tests	90%	

CH - Class hours: 25 h.
NCH - Non-class hours: 15,5 h.
TH - Total hours: 40,5 h.

CONTENTS

1.   Biosignals

1.1. Introduction

1.2. Biosignals

1.3. Interference and noise

2.   Biosensors

2.1. Introduction

2.2. Displacement measurements

2.3. Temperature measurements

2.4. Blood gas measurements

3.   Filters

3.1. Introduction

3.2. Passive filters

3.3. Active filters

4.   Amplifiers

4.1. Introduction

4.2. Types of amplifiers

4.3. Biomedical signal amplifiers

LEARNING RESOURCES AND BIBLIOGRAPHY	
Learning resources	**Bibliography**
Moodle Platform Class presentations Subject notes Lab practical training	Introduction to Biomedical Engineering, 3ED, John Enderle and Josephe Bronzino
	"Medical Instrumentation, Application and Design", 4 ED, John G. Webster. Wiley 2010
	"Biomedical sensors and Instruments", 2ED, T. Togawa, T. Tamura, P. Oeberg, CRC Press 2011
	Op Amps For Everyone, Ron Mancini