[MM3102] SIGNAL AND BIOMEDICAL IMAGES PROCESSING

GENERAL INFORMATION

Studies	MASTER'S DEGREE IN BIOMEDICAL TECHNOLOGIES			**Subject**	?
Semester	2	**Course**	0	**Mention / Field of specialisation**	
Character	COMPL. TRAINING				
Plan	2023	**Modality**	Face-to-face	**Language**	CASTELLANO
Credits	5	**Hours/week**	0.56	**Total hours**	10 class hours + 115 non-class hours = **125 total hours**

PROFESSORS

BARRENETXEA CARRASCO, MAITANE
AYALA FERNANDEZ, UNAI

REQUIRED PREVIOUS KNOWLEDGE

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

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
G_R066 - To design and develop systems for signal processing and biomedical images	x			5
			Total:	5

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

SECONDARY LEARNING RESULTS

RMM004 To know the main features of the biosignals that originate in the human body.

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		7 h.	7 h.
Conducting tests, giving presentations, presenting defences, taking examinations and/or doing checkpoints		2 h.	2 h.
Tutoring sessions and monitoring of training activities	1 h.		1 h.

EVALUATION SYSTEM	W	MAKE-UP MECHANISMS
Individual written and/or oral tests or individual coding/programming tests	100%	Individual written and/or oral tests or individual coding/programming tests

CH - Class hours: 1 h.
NCH - Non-class hours: 9 h.
TH - Total hours: 10 h.

RMM005 Design and develop signal processing methods in the time domain and in the Z transform domain.

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		15 h.	15 h.
Computer simulation exercises, individually and/or in teams		10 h.	10 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	4 h.	4 h.	8 h.
Carrying out exercises and solving problems individually and/or in teams		17 h.	17 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	60%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
Presentation and defence of exercises, case studies, computer practical work, simulation practical work, laboratory practical work, term projects, end of degree	40%	

project, master's thesis, challenges and problems

CH - Class hours: 4 h.
NCH - Non-class hours: 46 h.
TH - Total hours: 50 h.

RMM006 Design and develop signal processing methods in the frequency domain, and understand the concepts of digital filters and basic image processing operations.

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		20 h.	20 h.
Computer simulation exercises, individually and/or in teams		20 h.	20 h.
Presentation by the teacher in the classroom, in participatory classes, of concepts and procedures associated with the subjects	5 h.	5 h.	10 h.
Carrying out exercises and solving problems individually and/or in teams		15 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	60%
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	40%

MAKE-UP MECHANISMS

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

CH - Class hours: 5 h.
NCH - Non-class hours: 60 h.
TH - Total hours: 65 h.

CONTENTS

1.- Biosignals

1.1.- Introduction

1.2.- Biosignals

1.2.1.- Electromyogram

1.2.2.- Electrocardiogram

1.2.3.- Electroencefalogram

1.3.- Artefacts and noise

2.- Signals and systems.

2.1.- Introduction

2.2.- Clasification of signals and systems

2.3.- Sampling theorem

2.4.- Discrete signals and systems

2.6.- Analysis of discrete systems

2.7.- Correlation

3.- Z transform

3.1.- Introduction

3.2.-Z transform and its applications

3.3.- Analysis of linear systems

4. Fourier transform

4.1.- Introduction

4.2.- Fourier transform of discrete signals

4.3.- Properties

4.4.- Discrete Fourier Transform

4.5.- Application of Fourier Transform to systems

5.- Digital filters

5.1.- Introduction

5.2.- Filter types

5.3.- Filter properties

5.4.- FIR filters

5.5.- IIR filters

6.- Image processing fundamentals

-Intensity transformation and spatial filtering

-Segmentatation and morphological operations

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources	Bibliography
Subject notes	Digital signal processing . Indice Pearson Prentice Hall 2007
Moodle Platform	Tratamiento digital de señales John G. Proakis, Dimitris G. Manolakis. Pearson Education 2007 https://bc.vitalsource.com/tenants/openathens/books/9788483223475
Video projections	Discrete-time signal processing Alan V. Oppenheim, Ronald W. Schafer with John R. Buck. Prentice Hall 2010
Computer practical training	Gonzales, R. C., Woods, R. E., & Eddins, S. L. (2004). Digital image processing using MATLAB. Pearson Prentice Hall.