[GFN002] Biosignals and Signal Processing

GENERAL INFORMATION

Studies	DEGREE IN ENGINEERING PHYSICS APPLIED TO INDUSTRY			**Subject**	Biomedical Engineering
Semester	1	**Course**	4	**Mention / Field of specialisation**	???
Character	OPTIONAL				
Plan	2022	**Modality**	Face-to-face	**Language**	CASTELLANO
Credits	5	**Hours/week**	0	**Total hours**	0 class hours + 125 non-class hours = **125 total hours**

2030 AGENDA GOALS

PROFESSORS

BARRENETXEA CARRASCO, MAITANE
AYALA FERNANDEZ, UNAI
DE ITURRATE REYZABAL, MIKEL

REQUIRED PREVIOUS KNOWLEDGE

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

LEARNING RESULTS

LEARNING RESULTS	KC	SK	AB	ECTS
GFR306 - Understand the characteristics of human biosignals and be able to design and develop signal processing systems in the time and frequency domains, including digital filters	x	x		5
			Total:	5

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

SECONDARY LEARNING RESULTS

RGF414 **[!]** ***Diseña y desarrolla sistemas de tratamiento de señales en el dominio de la frecuencia, y conoce los filtros digitales***

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		25 h.	25 h.
Computer simulation exercises, individually and/or in teams		16 h.	16 h.

EVALUATION SYSTEM	W
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	50%

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: 0 h.
NCH - Non-class hours: 41 h.
TH - Total hours: 41 h.

RGF413 **[!]** ***Diseña y desarrolla sistemas de tratamiento de señales en el dominio del tiempo y en la transformada Z***

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		24 h.	24 h.
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		18 h.	18 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%	Reports on the completion of exercises, case studies, computer exercises, simulation exercises, laboratory exercises, term projects, challenges and problems
Individual written and/or oral tests or individual coding/programming tests	50%	

CH - Class hours: 0 h.
NCH - Non-class hours: 42 h.
TH - Total hours: 42 h.

RGF412 **[!]** ***Conoce las características principales de las bioseñales que se originan en el cuerpo humano***

LEARNING ACTIVITIES	CH	NCH	TH
Personal study and flexible development of concepts and subjects using active dynamics, to foster more meaningful learning		24 h.	24 h.
Carrying out exercises and solving problems individually and/or in teams		18 h.	18 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: 0 h.
NCH - Non-class hours: 42 h.
TH - Total hours: 42 h.

CONTENTS

1.- **Biosignals**

2.- **Fundamentals of Biosignal Processing**
  2.1.- Sampling
  2.2.- Digital Filters

3.- **Origin of Biomedical Images**

4.- **Fundamentals of Image Processing**
  4.1.- Intensity Transformations
  4.2.- Spatial Domain Filtering

LEARNING RESOURCES AND BIBLIOGRAPHY

Learning resources

Moodle Platform
Slides of the subject
Computer practical training

Bibliography

J. L. Prince, J. M. Links. 2015. Medical Imaging, Signals and Systems. Second edition. Pearson.

J. Enderle and J. Bronzino. 2011. Introduction to Biomedical Engineering. Elsevier.

Gonzalez, R. C. (2009). Digital image processing. Pearson education india.

Gonzalez, R. C., Woods, R. E., & Eddins, S. L. (2004). Digital image processing using MATLAB. Pearson Education India.

Rangayyan, R. M. (2004). Biomedical image analysis. CRC press.

Proakis, J. G. (2007). Digital signal processing: principles, algorithms, and applications, 4/E. Pearson Education India.