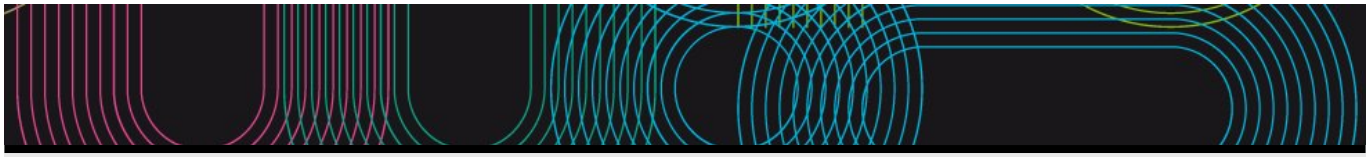

IDENTIFYING DATA				
Basics of bioengineering				
Subject	Basics of bioengineering			
Code	V05G300V01915			
Study programme	Degree in Telecommunications Technologies Engineering			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	English			
Department				
Coordinator	Hermida Domínguez, Ramón Carmelo			
Lecturers	Hermida Domínguez, Ramón Carmelo			
E-mail	rhermida@uvigo.es			
Web	http://faitic.uvigo.es			
General description	This course provides an introduction to several aspects of biomedical engineering, including basic concepts of human physiology, description of most common systems and biomedical signals, and a brief introduction to several electromedical systems. This course will be tough and evaluated in English. All the documentation for this course will be in English.			

Competencies	
Code	
B3	CG3: The knowledge of basic subjects and technologies that enables the student to learn new methods and technologies, as well as to give him great versatility to confront and adapt to new situations
B4	CG4: The ability to solve problems with initiative, to make creative decisions and to communicate and transmit knowledge and skills, understanding the ethical and professional responsibility of the Technical Telecommunication Engineer activity.
B9	CG9: The ability to work in multidisciplinary groups in a Multilanguage environment and to communicate, in writing and orally, knowledge, procedures, results and ideas related with Telecommunications and Electronics.
B10	CG10 The ability for critical reading of scientific papers and docs.
C72	(CE72/OP15) The knowledge of biomedical engineering elements and techniques and their application in solving therapy, monitoring and diagnostic problems.
D2	CT2 Understanding Engineering within a framework of sustainable development.
D3	CT3 Awareness of the need for long-life training and continuous quality improvement, showing a flexible, open and ethical attitude toward different opinions and situations, particularly on non-discrimination based on sex, race or religion, as well as respect for fundamental rights, accessibility, etc.
D4	CT4 Encourage cooperative work, and skills like communication, organization, planning and acceptance of responsibility in a multilingual and multidisciplinary work environment, which promotes education for equality, peace and respect for fundamental rights.

Learning outcomes			
Expected results from this subject	Training and Learning Results		
Know the systemic structure of the human physiology.	B3 B10	C72	D3
Identify biomedical signals and learn their utility in the clinical environment.	B3 B4 B9 B10	C72	D2 D3 D4
Adapt the adquired knowledge to propose solutions for the design of systems for diagnosis, monitorization and therapy.	B3 B4 B9 B10	C72	D2 D3 D4

Strengthen the capacity to follow a technical class in English.	B9 B10	D4

Contents	
Topic	
1. Introduction to biomedical engineering.	Physiology and anatomy of the circulatory system. Measurements in the cardiovascular system. Nervous and endocrine systems. Introduction to chronobiology.
2. Biomedical signals and systems.	Linear least-square estimation. Model comparison and analysis of variance. Techniques for model construction. Introduction to rhythmometry.
3. Diagnosis, monitorization, and therapy.	Criteria for the diagnosis of vascular risk. Ambulatory blood pressure monitoring. Treatment of hypertension: Current approaches. Chronotherapy for cardiovascular risk reduction. Early identification and prevention of complications in pregnancy.
4. Electromedical systems.	Diagnosis by X rays. Nuclear medicine. Ultrasounds. Nuclear magnetic resonance. Biotelemetry. Telemedicine.

Planning			
	Class hours	Hours outside the classroom	Total hours
Tutored works	2	35	37
Presentations / exhibitions	7	9	16
Troubleshooting and / or exercises	10	15	25
Master Session	21	42	63
Short answer tests	2	7	9
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies	
	Description
Tutored works	The student, in groups, prepares a document on an application of Biomedical Engineering. Through this methodology the students will develop the competencies CG3, CG4, CG9, and CE72.
Presentations / exhibitions	Exhibition by the students in front of the professor and the rest of students of the work realized in small groups. Through this methodology the students will develop the competencies CG9 and CG72.
Troubleshooting and / or exercises	Some topics will be complemented with problem resolution. Through this methodology the students will develop the competencies CG3, CG4, CG9, and CE72.
Master Session	Exposition by the professor of the main concepts of each topic. This will be complemented by the student´s own work with recommended readings to extend the concepts explained in the classroom. Through this methodology the students will develop the competencies CG3, CG4, CG9, CG10, CE72, CT2, CT3, and CT4.

Personalized attention	
Methodologies	**Description**
Master Session	These will be complemented by questions/answers encouraging the participation of every student.
Tutored works	Details pertaining to each assigned work will be discussed with each student.
Troubleshooting and / or exercises	Resolution of every exercise will be discussed with each student, as needed.

Assessment				
	Description	Qualification	Training and Learning Results	
Tutored works	Composition, in small groups, of a monographic document related to one of the electromedical systems in bioengineering (nuclear medicine, ultrasounds, magnetic resonance, biotelemetry, telemedicine).	30	B9 B10	C72 D4

Presentations / exhibitions	Exhibition by the students of the tutored work, and discussion of the findings with the professor and other students.	10	B9 B10	C72	D4
Troubleshooting and / or exercises	Short questions on the problems solved in the practices in relation to the contents of the master sessions.	30	B3 B4	C72	D2 D3
Short answer tests	The final exam will consist on small questions and problems in relation to the master sessions, laboratory practices, and presentation of the tutored works.	30	B3 B4	C72	D2 D3

Other comments on the Evaluation

Following the guidelines of the studies, two evaluation systems will be offered to the students inscribed on this course: continuous evaluation and evaluation at the end of the semester. Students should communicate their intention to renounce to be graded through continuous evaluation before the third week of class. The continuous evaluation will be based on the grades obtained in the tutored works and their exposition, the laboratory practices and the final test. The tutored work will be evaluated in terms of composition, accuracy and style and the grade will be the same for all members of the group. Individualized evaluation will be based on the exposition of the work (timing, clarity, accuracy) and the answers to specific questions by other students. The grades obtained throughout the continuous evaluation will only be valid for the current academic year. The possibility of a final examination, with theory and problems, will be provided to students who do not opt for the continuous evaluation. This exam will be rated between 0 and 10, and this will be the final grade obtained. The second chance of examination at the end of the academic year will have a similar structure to the final examination of those students who do not choose the continuous evaluation. All tests will be performed in English.

Sources of information

Basic Bibliography

Guyton & Hall, **Textbook of Medical Physiology**, 13th edition, W.B. Saunders Company, 2015

Weisberg S, **Applied Linear Regression**, 4ª Ed., J Wiley & Sons,, 2013

Hermida RC, Smolensky MH, Ayala DE, et al., **2013 ambulatory blood pressure monitoring recommendations for the diagnosis of adult hypertension, assessment of cardiovascular and other hypertension-associated risk, and attainment of therapeutic go**, 30, Chronobiol Int, 2013

Complementary Bibliography

Webster JG, **Medical Instrumentation. Application and Design**, 4th edition, Wiley, 2009

Cook RD, Weisberg S, **Residuals and Influence in Regression**, Chapman Hall, 1982

Enderle J, Blanchard S, Bronzino J., **Introduction to Biomedical Engineering.**, 3rd edition., Academic Press, 2012

Recommendations

Subjects that it is recommended to have taken before

Mathematics: Probability and Statistics/V05G300V01204