



## IDENTIFYING DATA

### Basics of bioengineering

Subject	Basics of bioengineering			
Code	V05G301V01415			
Study programme	Grado en Ingeniería de Tecnologías de Telecomunicación			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	4th	1st
Teaching language	English			
Department				
Coordinator	Hermida Domínguez, Ramón Carmelo			
Lecturers	Hermida Domínguez, Ramón Carmelo			
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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.			

## Training and Learning Results

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.		

## Expected results from this subject

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 of diagnostic, monitoring and therapy	B3 B4 B9 B10	C72	D2 D3 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
Mentored work	2	35	37
Presentation	7	9	16
Problem solving	10	15	25
Lecturing	21	42	63
Problem and/or exercise solving	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
Mentored work	The student, in groups, prepares a document on an application of Biomedical Engineering. Through this methodology the students will develop the competencies B3, B4, B9, and C72.
Presentation	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 B9 and C72.
Problem solving	Some topics will be complemented with problem resolution. Through this methodology the students will develop the competencies B3, B4, B9, and C72.
Lecturing	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 B3, B4, B9, B10, C72, D2, D3, and D4.

**Personalized assistance**

Methodologies	Description
Lecturing	Students will have the opportunity to attend personalized tutorials in the modality that each teacher will establish for this purpose at the beginning of the course. Tutorials may be carried out in person or by telematic means. On the page of the course in MooVi, within the section "Teachers and tutorials" ( <a href="https://moovi.uvigo.gal">https://moovi.uvigo.gal</a> ) the contact details of the teaching staff will be specified.
Mentored work	Students will have the opportunity to attend personalized tutorials in the modality that each teacher will establish for this purpose at the beginning of the course. Tutorials may be carried out in person or by telematic means. On the page of the course in MooVi, within the section "Teachers and tutorials" ( <a href="https://moovi.uvigo.gal">https://moovi.uvigo.gal</a> ) the contact details of the teaching staff will be specified.
Problem solving	Students will have the opportunity to attend personalized tutorials in the modality that each teacher will establish for this purpose at the beginning of the course. Tutorials may be carried out in person or by telematic means. On the page of the course in MooVi, within the section "Teachers and tutorials" ( <a href="https://moovi.uvigo.gal">https://moovi.uvigo.gal</a> ) the contact details of the teaching staff will be specified.

**Assessment**

	Description	Qualification	Training and Learning Results		
Mentored work	Composition, in small groups, of a monographic document related to one of the electromedical systems in bioengineering (nuclear medicine, ultrasounds, magnetic resonance, biotelemetry, telemedicine).	20	B9 B10	C72	D4
Presentation	Exhibition by the students of the tutored work, and discussion of the findings with the professor and other students.	10	B9 B10	C72	D4
Problem solving	Short questions on the problems solved in the practices in relation to the contents of the master sessions.	40	B3 B4	C72	D2 D3
Problem and/or exercise solving	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 own guidelines of the degree, two systems of assessment will be offered to the students registered in this course: continuous assessment and global assessment.

All the students that wish to renounce to the continuous assessment (election by default), will have to communicate it to the professor during the first month after the beginning of classes.

The continuous assessment will be based on the grades obtained in the tutored works and their exposition, as well as in up to three intermediate tests. 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 the professor and other students. The grades obtained throughout the continuous evaluation will only be valid for the current academic year. The tests of the continuous assessment are not recoverable, that is to say, if somebody cannot make them the professors are not obligated to repeat them. For a student under continuous assessment his/her final grade cannot be "not presented".

The students that do not opt by the continuous assessment will have to make a final examination, with theory and problems on all the contents of the course. This exam will be graded between 0 and 10, and this will be the final grade obtained.

The extraordinary exam, as well as the end-of-program exam, will have a similar structure to the final examination of those students who do not choose the continuous assessment.

All tests will be performed in English.

Plagiarism is regarded as serious dishonest behavior. If any form of plagiarism is detected in any of the tests or exams, the final grade will be FAIL (0), and the incident will be reported to the corresponding academic authorities for prosecution.

### Sources of information

#### Basic Bibliography

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

Weisberg S, **Applied Linear Regression**, 4<sup>a</sup> 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