UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: APPLIED BIOMEDICAL ENGINEERING
Code: 56524
Type: ELECTIVE
ECTS credits: 6
Degree: 359 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING (CR)
Academic year: 2020-21
Center: 602 - E.T.S. INDUSTRIAL ENGINEERING OF C. REAL
Group(s): 20
Year: 4
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **MARIA GLORIA BUENO GARCIA** - Group(s): **20**

Building/Office	Department	Phone number	Email	Office hours
Edificio Politécnico, 2-D02	INGENIERÍA ELÉCTRICA, ELECTRÓNICA, AUTOMÁTICA Y COMUNICACIONES	Vía Teams	gloria.bueno@uclm.es	

Lecturer: **NOELIA VALLEZ ENANO** - Group(s): **20**

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2. Pre-Requisites

Basic knowledge of computer programming. Programming language: Matlab.

3. Justification in the curriculum, relation to other subjects and to the profession

Biomedical engineering is the result of the application of engineering principles and techniques to the field of medicine and biology. It is mainly dedicated to the development of bio-sanitary products and technologies such as medical equipment, prostheses, medical devices, diagnostic devices (among which biomedical imaging plays a very important role), and therapy devices. It also intervenes in the management or administration of technical resources linked to a hospital system. It combines the experience of engineering with medical needs to obtain benefits in health care. Moreover, tissue culture, as well as the production of certain drugs, is usually considered part of bioengineering.

Therefore, biomedical engineering can be considered a subject where electrical, mechanical, chemical, optical, signal processing, computer vision and other engineering principles are applied to understand, modify or control systems; as well as to design and produce assistance tools in the process of patient diagnosis, monitoring and treatment. Thus, it is mainly related to subjects such as computer vision (for the part of diagnostic imaging and therapy devices), mechanics, electricity, signal processing, systems and signals or automatic regulation.

4. Degree competences achieved in this course

Course competences

Code	Description
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A04	To be able to transmit information, ideas, problems and solutions to a specialized audience.
A05	To have developed the learning skills necessary to undertake subsequent studies with a greater degree of autonomy.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
A09	Ethical and professional commitment.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Industrial Electronic Engineering and Automation.
A18	To have organization and planning skills used in businesses and other institutions and organizations.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
E09	Knowledge of technologies necessary for developing biomedical applications.
E11	Knowledge of electronic communications and modes of transmission. Knowledge of telematics.

5. Objectives or Learning Outcomes

Course learning outcomes

Description

The student is familiar with and knows how to use sensors and actuators with an application in the industrial environment
Know how to apply fundamental equations of the mechanics of solids to the study of the movement of robots and manipulators, with the aim of being able to develop efficient and precise algorithms for the control of movement
Ability to design, configure and calibrate systems of control, measurement and acquisition of data using the environment of computer based graphics

Additional outcomes

6. Units / Contents

Unit 1: Biomedical Engineering Introduction
Unit 2: Biomedical Engineering Fundamentals
Unit 3: Biomedical Instrumentation
Unit 4: Biomechanics and Biomaterials
Unit 5: Biomedical Imaging
Unit 6: Biomedical Computing and Telemedicine

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	A02 A04 A05 A07 A08 A09 A12 A13 A18 CB02 CB03 CB05 E09 E11	1	25	N	-	The teacher will explain the fundamental contents of the topic.
Laboratory practice or sessions [ON-SITE]	Cooperative / Collaborative Learning	A02 A04 A05 A07 A08 A09 A12 A13 A18 CB02 CB03 CB05 E09 E11	1	25	Y	Y	They will consist in the resolution of various problems and tests related to the content of the subject. The appropriate specific software will be used in each of the practices.
Study and Exam Preparation [OFF-SITE]	Self-study	A02 A04 A05 A07 A08 A09 A12 A13 A18 CB02 CB03 CB05 E09 E11	3.6	90	N	-	The student will do an autonomous work for the preparation of tests and works of the subject.
Workshops or seminars [ON-SITE]	Workshops and Seminars	A02 A04 A05 A07 A08 A09 A12 A13 A18 CB02 CB03 CB05 E09 E11	0.24	6	Y	Y	Conferences by experts in several areas of Biomedical Engineering.
Field work [ON-SITE]	Self-study	A02 A04 A05 A07 A08 A09 A12 A13 A18 CB02 CB03 CB05 E09 E11	0.16	4	Y	Y	Assistance to CSIC centers specialized in Biomedical Engineering.
		Total:	**6**	**150**			
		Total credits of in-class work: 2.4					**Total class time hours: 60**
		Total credits of out of class work: 3.6					**Total hours of out of class work: 90**

As: Assessable training activity
Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of problem solving and/or case studies	20.00%	20.00%	Laboratory exercises
Projects	40.00%	40.00%	Final practice work
Progress Tests	40.00%	40.00%	Short questionnaires
Total:	**100.00%**	**100.00%**	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject , an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:

Continuous assessment:

To pass the subject the student must obtain a minimum final mark of 5 out of 10.

Non-continuous evaluation:

Evaluation criteria not defined

Specifications for the resit/retake exam:

The conditions remains the same. Students can keep the mark of the activities that are equal or greater than 5.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	**hours**
Unit 1 (de 6): Biomedical Engineering Introduction	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	2
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	2
Unit 2 (de 6): Biomedical Engineering Fundamentals	
Activities	**Hours**

Class Attendance (theory) [PRESENCIAL][Lectures]	2
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	2
Unit 3 (de 6): Biomedical Instrumentation	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	4
Unit 4 (de 6): Biomechanics and Biomaterials	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	4
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	4
Unit 5 (de 6): Biomedical Imaging	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	10
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	10
Unit 6 (de 6): Biomedical Computing and Telemedicine	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	8
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	8
Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	30
Laboratory practice or sessions [PRESENCIAL][Cooperative / Collaborative Learning]	30
Total horas:	60

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
John Enderle y Joseph Bronzino	Introduction to Biomedical Engineering	Academic Press Series in Biomedical Engineering		978-0123749796	2011	
John Enderle, Susan M. Blanchard y Joseph D. Bronzino	Introduction to Biomedical Engineering	Academic Press Inc; 2nd Revised edition		978-0122386626	2005	
Joseph D. Bronzino	Biomedical Engineering Handbook	CRC Press		0-8493-0461-X	2000	
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