Universida_{de}Vigo

including response to stimuli

Subject Guide 2023 / 2024

IDENTIFYIN	G DATA				
(*)Biomater	iales avanzados e enxeñaría ti	isular			
Subject	(*)Biomateriales				
	avanzados e				
	enxeñaría tisular				
Code	V04M192V01106				
Study	Máster				
programme	Universitario en				
	Ingeniería				
	Biomédica			1	
Descriptors	ECTS Credits		Choose	Year	Quadmester
	6		Mandatory	1st	1st
Teaching	Spanish				
language	Galician				
Department					
Coordinator	González Fernández, Pio Manuel				
	Serra Rodríguez, Julia Asunción				
Lecturers	Chiussi , Stefano				
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	López Álvarez, Miriam				
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Web					
General					
description					

Tra	ining and Learning Results		
Coc	le		
A4	Students can communicate their conclusions, and the knowledge and rationale underpinning these, non-specialist audiences clearly and unambiguously.	to specialist and	
B1	Ability to design, develop, implement, manage and improve products and processes in the different areas of the biomedical engineering, by means of appropriate analytical, computational or experimental techniques.		
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and t provide them the versatility to adapt to new situations.	heories, and	
B4	Ability to solve problems with initiative, decision making, creativity, critical reasoning and to commu knowledge, abilities and skills in the field of biomedical engineering.	inicate and transmit	
B5	Knowledge to carry out measurements, calculations, assessments, appraisals, surveys, studies, report other similar works.	orts, work plans and	
C6	Knowledge of tissue engineering and ability to analyze, manage and design biomaterials with advan response to stimuli.	ced properties and	
D1	Ability to understand the meaning and application of the gender perspective in the different fields o professional practice with the aim of achieving a more just and equal society.	f knowledge and in	
D3	Sustainability and environmental commitment. Equitable, responsible and efficient use of resources		
Exp	pected results from this subject		
Expected results from this subject		Training and Learning Results	
Kno	w the basic principles of tissue engineering and the ones of biomaterials with advanced properties,	B3	

C6 D1 D3

Apply knowledge of the theoretical concepts of tissue engineering and the ones of biomaterials with	A4
advanced properties, including response to stimuli.	B1
	B4
	B5
	C6
	D1
	D3

Contents	
Торіс	
1 Introduction to advanced biomaterials and	1.1. Basic concepts on advanced biomaterials
tissue engineering	1.2. Basic concepts on tissue engineering
2 Design of advanced biomaterials	2.1. Basic technical features and examples of bioinspired biomaterials
	2.2. Basic 3D design tools
	2.3. Scaffolds for tissue engineering
	2.4. Biomaterials with osteoconductive and osteoinductive properties
	2.5. Biomaterials with bactericidal properties
	2.6. Biomaterials with antitumor properties
3 Smart biomaterials	3.1. Basic technical features and examples of biosensors
	3.2. Heat-transfer-based biomedical devices by laser-induced photothermy
	3.3. Heat-transfer-based biomedical devices by electromagnetic induction
	3.4. 4D Printing: 3D biomaterials shape/function modification over time in
	response to specific temperature, humidity or pressure conditions
4 Manufacture, characterization and sterilization 4.1. Techniques for the manufacture of advanced biomaterials	
of advanced biomaterials	4.2. Techniques for the characterization of advanced biomaterials
	4.3. Techniques for the sterilization of biomaterials
5 Biological evaluation of biomedical devices	5.1. Nature of the substrate/support for culture and aseptic techniques
	5.2. Physicochemical and physiological conditions of the cell growth
	medium
	5.3. Incubation conditions: gas phase, humidity and temperature
	5.4. Advantages and disadvantages of cell culture
6 Case reports	6.1. Case study in Musculoskeletal System
	6.2. Case study in Dentistry
	6.3. Case study in Otorhinolaryngology
	6.4. Case study in Tissue Engineering
7 Practical experiences	7.1. Design and manufacture of advanced biomaterials
	7.2. Design and 3D manufacture for tissue engineering
	7.3. Hyperthermia testing
	7.4. Analysis of advanced biomaterials
	7.5. Manufacturing in Clean Room
	7.6. Cytotoxicity assay

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	10	25	35
Presentation	10	21	31
Case studies	4	5	9
Research based methodologies	4	5	9
Laboratory practical	16	30	46
Essay questions exam	1	0	1
Presentation	1	0	1
Report of practices, practicum and external pr	actices 1	16	17
Systematic observation	1	0	1
*The information in the planning table is for g	uidance only and does no	ot take into account the het	erogeneity of the students.

Methodologies	
	Description
Lecturing	Content exposure by the lecturer on the subject matter of study, including theoretical bases, guidelines for reports and proposal of practical exercises that the student has to develop.
Presentation	Oral exposure by the students to the teacher and a group of students on a particular subject of interest within the contents or on the obtained results from a task, exercise, project It will be carried out individually or in a group.
Case studies	Analysis of specific cases on the subject under study. The results of the search and analysis of the information will be presented to the teacher and group of students.

Activities developed in the laboratory practices and the preparation of reports based on the results of the scientific research carried out by following the scientific methodology. Activities of application of knowledge to specific situations implying the acquisition of basic and procedural skills related to the subject matter of study. They will be performed in prepared spaces with specialized equipment (laboratories, computer rooms...)

Personalized assistance			
Methodologies	Description		
Presentation	Resolution of doubts and personalized help during one-on-one tutoring hours		
Research based methodologies	Personalized guide on the experimental work taking into account the specific strengths and needs of each student		
Laboratory practical	Personalized guide on the experimental work taking into account the specific strengths and needs of each student		

Assessment					
	Description	Qualification	Trair Lea Ré	arnin arnin	and g
Essay questions exam	Tests that include open questions on a developed topic as well as short answer questions.	30	B1 B3 B4	C6	<u> </u>
Presentation	Content exposure by the students to the teacher and/or a group of students on a topic of relevance about the contents or the obtained results from a task, exercise, project It can be carried out individually or in a group.	30 /	A4 B3 B4	C6	
Report of practices, practicum and external practices	Preparation of a report by the students in which the characteristics of the assigned work will be reflected. Students must describe the tasks and developed protocol, show the obtained results or observations made, as well as the procedure followed for data analysis and treatment.	30	4 B1 B3 B4 B5	C6	
Systematic observation	Attentive, rational, planned and systematic perception to describe and record the attitude/aptitute of the student.	10 /	\4 B4		D1 D3

Other comments on the Evaluation

The subject surpasses when obtaining a mark equal or upper to 5 points (on 10 points), obtained of the following form:

a) Continuous evaluation, practices of laboratory (30%) and oral expositions (30%), mandatory with minimum assistance of 80%;b) Global evaluation, proof of short answer (30%) and systematic observation (10%)c) Second opportunity, only reevaluation of methodoly/proofs considered non apt.

Sources of information

Basic Bibliography

R. lan Freshney, **Culture of Animal Cells: A Manual of Basic Technique and Specialized Applications**, 7th, Wiley Blackwell, 2016

William R. Wagner, Shelly E. Sakiyama-Elbert, Guigen Zhang, Michael J. Yaszemsk, **Biomaterials science : an introduction to materials in medicine**, 4, Elsevier, 2020

Clemens A. van Blitterswijk, Jan de Boer, **Tissue engineering**, 2, Academic Press, 2015 **Complementary Bibliography**

Recommendations

Other comments

EXCEPTIONAL MEASURES PLANNED

=== ADAPTATION OF METHODOLOGIES ===

* Teaching methodologies that are modified

* Remote-teaching

The Remote Campus tools will be used in synchronous mode for the presentation of contents, fundamentals, theory, general guidelines for carrying out activities and practical cases. All teaching material and resources will be available on the Faitic platform.

* Non-face-to-face mechanism for student assistance (tutoring)

Personalized attention. Communication via e-mail or other necessary telematic tool. Virtual Office Tutoring (Remote Campus).

=== ADAPTATION OF THE ASSESSMENT ===

On-line tests will be carried out (Remote Campus and Faitic) to expose topics, send papers and a multiple answer questionnaire.

The ratios indicated in the teaching guide of the subject will be maintained.