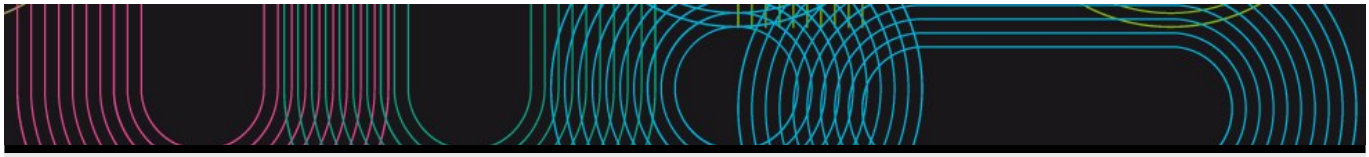

IDENTIFYING DATA				
(*)Enxeñaría de superficies para aplicacións biomédicas				
Subject	(*)Enxeñaría de superficies para aplicacións biomédicas			
Code	V04M192V01205			
Study programme	Máster Universitario en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Cristóbal Ortega, María Julia			
Lecturers	Cristóbal Ortega, María Julia			
E-mail	mortega@uvigo.es			
Web				
General description	The aim of this subject is to know the principles of surface engineering for biomedical applications.			

Skills	
Code	
A1	Knowledge and understanding that provide a basis or opportunity for originality in developing and / or applying ideas, often in a research context.
A3	That students are able to integrate knowledge and handle complexity and formulate judgments based on information that was incomplete or limited, include reflecting on social and ethical responsibilities linked to the application of their knowledge and judgments.
A4	Students can communicate their conclusions, and the knowledge and rationale underpinning these, to specialist and non-specialist audiences clearly and unambiguously.
B4	Ability to solve problems with initiative, decision making, creativity, critical reasoning and to communicate and transmit knowledge, abilities and skills in the field of biomedical engineering.
B6	Capacity for handling specifications, regulations and mandatory standards.

Learning outcomes	
Expected results from this subject	Training and Learning Results
To know the principles of surface engineering for biomedical applications	A1
Advanced knowledge of the various techniques that make it possible to modify the surface of different biomaterials for achieve adequate control over their behavior	A1
To apply the knowledge of surface engineering for biomedical applications	A3 A4 B4 B6
To know the main techniques currently used to characterize these surfaces from the chemical point of view, and microstructural structure that allows obtaining information on the modification carried out and analyzing its effect on the behavior of the biomaterial	A1 A3 B6

Contents
Topic

1. Introduction to Surface Engineering for biomedical applications	1.1 Importance of the surface: surface properties 1.2 Types of biomaterials: Interaction of with the biological media 1.3 Surface Engineering Concept
2.- Advanced surface modification techniques	2.1 Texturing methods 2.2 Physical and chemical methods of surface functionalization 2.3 Ion Implantation 2.4 Electrolytic Oxidation 2.5 Thermal Projection 2.6 PVD and CVD 2.7 Electrochemical and electrophoretic techniques 2.8 Sol-gel coatings
3.- Surface characterization techniques	3.1 SEM/TEM 3.2 SIMS 3.3 AFM 3.4 GAXRD 3.5 Thermal analysis techniques (TG, DSC and ATD) 3.6 Contact Angle Measurements

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	30	30	60
Autonomous problem solving	0	5	5
Laboratory practical	15	13.5	28.5
Mentored work	2	11	13
Seminars	3	3	6

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Lecturing	Presentation by the teacher of the contents on the subject under study, theoretical bases and/or guidelines of a work, exercise that the student has to develop
Autonomous problem solving	Activity in which problems and/or exercises related to the subject are formulated. The student must develop the analysis and resolution of the problems and/or exercises autonomously.
Laboratory practical	Activities of application of knowledge to specific situations and acquisition of basic and procedural skills related to the subject matter of study. They take place in special spaces with specialized equipment (laboratories, computer rooms, etc.).
Mentored work	The student, individually or in a group, prepares a document on the topic of the subject or prepares seminars, research, reports, essays, summaries of readings, conferences etc The work is presented at the end of the semester in front of the rest of the students.
Seminars	Activity focused on work on a specific topic, which allows deepening or complementing the contents of the subject. They can be used as a complement to theoretical classes.

Personalized assistance

Methodologies	Description
Mentored work	The lecturer, during tutorial hours, will resolve any doubts that the student may have.
Lecturing	The teacher, during the development of the theoretical classes, will resolve any doubts that the student may have.
Seminars	The teacher, during the seminar, will resolve any doubts that the student may have.
Laboratory practical	The professor, during the development of the practical laboratory classes, will solve the doubts that the student has.

Assessment

	Description	Qualification	Training and Learning Results	
Lecturing	It will be done through a written test (exercises, short questions and type test) that collects the knowledge acquired by the student throughout the course.	65	A1 A3	B4 B6
Laboratory practical	It will be evaluated according to the criteria of attendance and degree of participation, reports on the development of internships or visits to companies (individual or by groups).	15	A1 A3	B4 B6
Mentored work	They will be evaluated by the reports presented, and the presentation in class of the work carried out.	20	A1 A3 A4	B4 B6

Other comments on the Evaluation

Ethical commitment: The student is expected to present appropriate ethical behavior. In case of detecting unethical behavior (for example: copying, plagiarism, use of unauthorized electronic devices,...) it will be considered that the student does not meet the

requirements necessary to pass the subject. In this case, the overall qualification in the current academic year will be a fail (0.0).

The use of any electronic device during the evaluation tests will not be allowed unless expressly authorized.

The fact of introducing an unauthorized electronic device in the exam room will be considered reason for not passing.

of the subject in the current academic year and the overall qualification will be a fail (0.0).

First edition of the Minutes; Continuous assessment:

The continuous evaluation will be carried out during the teaching period of the subject, according to the criteria established in the section

previous. In any case, to pass the subject it will be necessary to achieve a minimum score of 40% in the written test carried out on the date previously set by the center.

The final grade of the first edition will be the sum of the two grades (Continuous Assessment (3/10) and Final Theory Exam (7/10)), if the minimum required in the theoretical exam is reached or exceeded (40%, which means 2.8/7). If the student does not pass this condition, the final grade for the subject will be that of the continuous evaluation.

Those students who do not accept continuous assessment will be assessed with a final exam on the contents of the entire subject, which will account for 100% of the grade.

July Exam (2nd Edition)

Continuous assessment will not be taken into account in the July exam. It will be possible to obtain 100% of the qualification in the exam that will be held on the date previously set by the center.

Sources of information

Basic Bibliography

M Jaffe, W. Hammond, P Tolias, T Arinzeh(Editores), **Characterization of Biomaterials**, 9780081016244, 1, ELSEVIER, 2012

Bandyopadhyay, Amit; Bose, Susmita, **Characterization of Biomaterials**, 9781493301379, 1, ELSEVIER, 2013

Saber Amin Yavari (Editor), **Surface Engineering of Biomaterials**, 3039368982, 1, Mdpi AG, 2020

Complementary Bibliography

Saber Amin Yavari, **Surface Engineering of Biomaterials**, 10.3390/books978-3-03936-899-0, Coatings, 2020

Recommendations

Subjects that are recommended to be taken simultaneously

(*)Técnicas avanzadas no invasivas en enxeñaría biomédica: Aplicación do láser en medicina/V04M192V01208