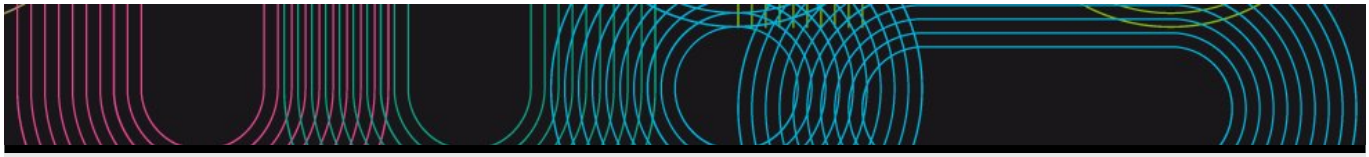

IDENTIFYING DATA				
(*)Mecánica de materiais e tecidos blandos				
Subject	(*)Mecánica de materiais e tecidos blandos			
Code	V04M192V01207			
Study programme	Máster Universitario en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	1st	2nd
Teaching language	Spanish			
Department				
Coordinator	Riveiro Rodríguez, Antonio			
Lecturers	Comesaña Piñeiro, Rafael Riveiro Rodríguez, Antonio			
E-mail	ariveiro@uvigo.es			
Web				
General description	(*)Nesta materia presentarase a teoría da mecánica de medios continuos a materiais e tecidos brandos e hiperelásticos. Introduciranse os conceptos fundamentais detrás do comportamento mecánico da materia branda. Así mesmo, daranse a coñecer os diferentes métodos experimentais de caracterización de materiais brandos, así como métodos de simulación numérica de problemas mecánicos que inclúan materiais brandos.			

Skills	
Code	
A5	Students must possess the learning skills that enable them to continue studying in a way that will be largely self-directed or autonomous.
B3	Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.

Learning outcomes	
Expected results from this subject	Training and Learning Results
To know the theory of elasticity and resistance of materials applied to soft and hyperelastic materials and tissues.	B3
To apply knowledge of the mechanics of continuous media to soft and hyperelastic materials and tissues.	A5 B3

Contents	
Topic	
1. Introduction to soft solids	Rubber-like materials, gels, soft biological tissues, etc.
2. Mechanical characterization	Research, experiments, interpretation
3. Continuous non-linear mechanics	Stresses, deformations, laws of equilibrium.
4. Constitutive modeling of soft materials	Constitutive models, simulation.
5. Elasticity under large deformations	Hyperelastic materials
6. Dissipative behavior	Description and characterization of the dynamic response
7. Composite materials	Mechanics of composite materials, anisotropic and heterogeneous, obtained biomimetically, through additive manufacturing, etc.

Planning			
	Class hours	Hours outside the classroom	Total hours
Lecturing	18	18	36

Problem solving	6	6	12
Laboratory practical	12	0	12
Mentored work	0	40	40
Autonomous problem solving	0	12.5	12.5

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

Methodologies

	Description
Lecturing	Exposition of the general aspects and contents of the subject under study by the teacher in a structured way, with special emphasis on the foundations and most important aspects or aspects that are most difficult to understand for the student
Problem solving	Activity in which problems and/or exercises related to the subject are formulated. The teacher will indicate the appropriate or correct solutions through the exposition of routines, formulas or algorithms, transformation procedures of the available information and will help the students with the interpretation of the results. It will be used as a complement to the lecture.
Laboratory practical	Laboratory practices carried out cooperatively and in which the theoretical concepts seen in the classroom will be put into practice. They take place in special spaces with specialized equipment (laboratories, computer rooms, etc.).
Mentored work	Students, individually or in groups, will prepare a document on the subject matter or will prepare seminars, research, reports, essays, summaries of readings, conferences, etc.
Autonomous problem solving	Activity in which problems and/or exercises related to the subject (theoretical part and practical part) will be formulated. The student must develop the analysis and resolution of the problems and/or exercises autonomously.

Personalized assistance

Methodologies	Description
Lecturing	It will be carried out fundamentally in the office hours.
Problem solving	It will be carried out fundamentally in the office hours.
Laboratory practical	It will be carried out fundamentally in the office hours.
Mentored work	It will be carried out fundamentally in the office hours.
Autonomous problem solving	It will be carried out fundamentally in the office hours.

Assessment

	Description	Qualification	Training and Learning Results	
Laboratory practical	Preparation of a document by the students in which the work carried out during the laboratory practices is reflected. Students must describe the procedures developed, as well as the results obtained or observations made in relation to questions raised during the laboratory practice.	20	A5	B3
Mentored work	Work carried out in a team but evaluated individually (integrating the development of questions and the resolution of corresponding problems/exercises). Each team of students will develop a problem proposed by the teacher and that will integrate both the theoretical and practical aspects related to the subject.	80	A5	B3

Other comments on the Evaluation

The subject will be considered passed when the student's final grade exceeds 5.0.

First Call or Edition

Continuous Assessment Mode: The final mark of the subject will combine the grades of the problem/question bulletins proposed (20%), the work proposed in the practical laboratory classes (20%) and the work proposed, supervised and developed throughout the course. of the course (60%). In any case, it is necessary to obtain a minimum grade of 4 points out of 10 points in each of the problem/question bulletins, in each of the works proposed in the laboratory classes, as well as in the proposed supervised work.Non-Continuous Assessment Mode: A period of two weeks from the beginning of the course is established for students to document their inability to follow the continuous assessment process. The student who waives continuous assessment will take a final exam that will cover the totality of the contents of the subject, both theoretical and practical, and which may include multiple choice questions, reasoning or development questions, problem solving or the development of a practical case. The exam grade will be 100% of the final grade. A minimum grade of 5.0 points out of a possible 10.0 is required to pass the subject. This exam will be held on the dates established by the School management for the final exam.Second Call or Edition:

Students who wish to improve their grade or who did not pass the subject in the First Call may take the Second Call, where they will take a final exam that will cover all the contents of the subject, both theoretical and practical. The second call will be held on the date established by the School's management.

Sources of information

Basic Bibliography

L Ortiz Berrocal, **Elasticidad**, 9788448120467, 3ª, McGraw-Hill, 1998

GA Holzapfel, **Nonlinear Solid Mechanics: A Continuum Approach for Enineering: A Continuum Approach for Engineering**, 978-0471823193, Wiley, 2000

Stephen C. Cowin; Stephen B. Doty, **Tissue Mechanics**, 978-0-387-36825-2, Springer, 2007

Complementary Bibliography

Masao Doi, **Soft Matter Physics**, 9780199652952, Oxford University Press, 2013

Javier Bonet; Richard D. Wood, **Nonlinear Continuum Mechanics for Finite Element Analysis**, 9780511755446, 2ª, Cambridge University Press, 2010

Stephen C. Cowin; Jay D. Humphrey, **Cardiovascular Soft Tissue Mechanics**, 9789048159178, Kluwer Academic Publishers, 2004

Recommendations

Other comments

Continuous assessment is not contemplated if students cannot attend theoretical classes or laboratory practices due to overlapping with other activities.

The sending of electronic messages or the use of the mobile phone during the development of the teaching classes supposes the expulsion of the classroom. Likewise, you will lose your status of continuous evaluation

The original teaching guide is written in Spanish. In case of discrepancies, the Spanish version of this guide will prevail.