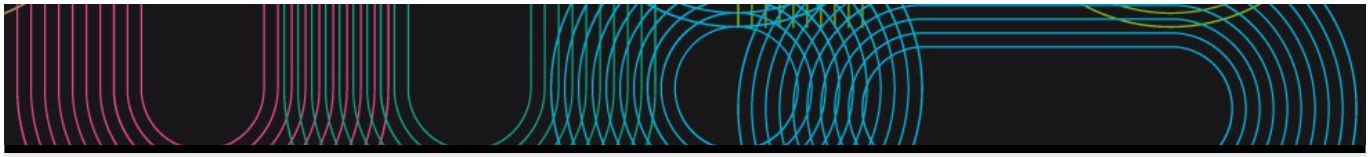

IDENTIFYING DATA				
(*)Simulación biomecánica				
Subject	(*)Simulación biomecánica			
Code	V04M192V01308			
Study programme	Máster Universitario en Ingeniería Biomédica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	4.5	Optional	2nd	1st
Teaching language				
Department				
Coordinator	Segade Robleda, Abraham González Baldonedo, Jacobo			
Lecturers	González Baldonedo, Jacobo Segade Robleda, Abraham			
E-mail	jacobo.gonzalez.baldonedo@uvigo.es asegade@uvigo.es			
Web	http://moovi.uvigo.gal			
General description	(*)Introdución á simulación e cálculo mecánico de sistemas e dispositivos biomédicos.			

Training and Learning Results	
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.

Expected results from this subject	
Expected results from this subject	Training and Learning Results
Capacity for the study of the mechanical behaviour of joints and prosthetic systems.	A5 B3
Apply knowledges of simulation and mechanical calculation to biomechanical systems	B3

Contents	
Topic	
Fundamentals of finite element simulation	- Pre-processing, solution and post-processing - Generalities of non-linear calculus - Non-linear problem solving methods - Equilibrium trajectories - Large deformations
Computational Dynamics	- Implicit Dynamics: Implicit Euler method, Newmark method. - Explicit Dynamics: Explicit Euler method, finite difference method.
Preparation of geometry for finite element analysis.	- Definition of the problem, establishment of adequate boundary conditions. - Material behavior models. - Analysis of results: tensions, deformations, evaluation of contacts, resistance evaluation. - Calculation of components.

Planning

	Class hours	Hours outside the classroom	Total hours
Lecturing	13	17	30
Problem solving	5	15	20
Practices through ICT	17	32	49
Objective questions exam	2	0	2
Report of practices, practicum and external practices	1	10.5	11.5

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

Methodologies

	Description
Lecturing	Introduction and description of the different concepts and techniques related to the subject
Problem solving	Putting the knowledge acquired in the field into practice by applying it to solving common engineering problems
Practices through ICT	Practices with the support of ICT Troubleshooting simulation of devices and biomechanical cases using commercial software

Personalized assistance

Methodologies	Description
Lecturing	Personalized attention to all the doubts raised by the students
Problem solving	Group or individual tutorials will take place during tutoring hours, which will serve to reinforce the knowledge acquired and tutor the proposed work.
Practices through ICT	Group or individual tutorials will take place during tutoring hours, which will serve to reinforce the knowledge acquired and tutor the proposed work.

Assessment

	Description	Qualification	Training and Learning Results	
Practices through ICT	Once the internships have been completed, reports of internships and other tasks carried out IN GROUP will be delivered	40	A5	B3
Objective questions exam	There will be a multiple choice exam on the contents developed in the subject	10		B3
Report of practices, practicum and external practices	Reports or work carried out INDIVIDUALLY will be delivered on assumptions proposed in the subject	50	A5	B3

Other comments on the Evaluation

To pass the subject, students must obtain at least a score of 40% in the Report on practicals, practicum and external practices (work done individually) section.

By default, the evaluation will be in Continuous Evaluation mode for all students. Anyone who wishes and requests it in the time and manner specified by the School may waive this modality of evaluation.

For students who take the subject in the Continuous Assessment modality and do not pass the subject in the First Chance call (May), to pass the subject in the Second Chance call (July), the subject teachers will They will indicate the deliveries or work that will have to be carried out in order to be evaluated in that call.

Students who renounce the Continuous Evaluation modality will be evaluated with 100% of the subject's score in a single test. In this case, the student must notify the subject teachers sufficiently in advance, who will indicate the recovery methodology.

Sources of information

Basic Bibliography

J. Bonet, R. D. Wood, **Nonlinear Continuum Mechanics for Finite Element Analysis**, Cambridge, 2008

R. R. Cray, A. J. Kurdila, **Fundamentals of Structural Dynamics**, Wiley, 2006

Complementary Bibliography

G. A. Holzapfel, **Nonlinear Solid Mechanics: A Continuum Approach for Engineering**, Wiley, 2000

Ted Belytschko, Wing Kam Liu, Brian Moran, Khalil Elkhodary, **onlinear Finite Elements for Continua and Structures**, Wiley, 2014

O. C. Zienkiewicz R. L. Taylor J.Z. Zhu, **The Finite Element Method: Its Basis and Fundamentals**, Elsevier, 2013

Recommendations

Subjects that it is recommended to have taken before

(*)Biomateriales avanzados e enxeñaría tisular/V04M192V01106
(*)Mecánica de materiais e tecidos blandos/V04M192V01207
(*)Métodos matemáticos aplicados á enxeñaria biomédica/V04M192V01102