Teaching Guide				
Identifying Data				2022/23
Subject (*)	Simulation of Mechanic and Structural Systems		Code	730497224
Study programme	Mestrado Universitario en Enxeñaría Industrial (plan 2018)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	Second	Optional	4.5
Language	Spanish			
Teaching method	Hybrid			
Prerequisites				
Department	Enxeñaría Naval e Industrial			
Coordinador	Gutierrez Fernandez, Ruth Maria	E-mail	ruth.gutierrez@udc.es	
Lecturers	Gutierrez Fernandez, Ruth Maria	E-mail	ruth.gutierrez@udc.es	
Web	http://https://sites.google.com/site/structuralanalysislab/home			
General description	Nesta materia preténdese adquirir competencias para o deseño e análise de sólidos e conxuntos mecánicos sometidos a esforzos e capacidades de análise dos estados de deformación e tensión dos seus elementos.			

Study programme competences / results	
Code	Study programme competences / results
A19	EI3 - Knowledge and skills for the calculation and design of structures.
B1	CB6 - Possess and understand knowledge that provides a basis or opportunity to be original in the development and / or application of ideas, often in a research context.
B2	CB7 - That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of ??study.
B3	CB8 - That students are able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments.
B4	CB9 - That the students know how to communicate their conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized audiences in a clear and unambiguous way.
B5	CB10 - That students have the learning skills that allow them to continue studying in a way that will be largely self-directed or autonomous.
B6	G1 - Have adequate knowledge of the scientific and technological aspects in Industrial Engineering.
B7	G2 - Project, calculate and design products, processes, facilities and plants.
B13	G8 - Apply the knowledge acquired and solve problems in new or unfamiliar environments within broader and multidisciplinary contexts.
B14	G9 - Be able to integrate knowledge and face the complexity of making judgments based on information that, being incomplete or limited, includes reflections on social and ethical responsibilities linked to the application of their knowledge and judgments.
B15	G10 - Knowing how to communicate the conclusions -and the knowledge and ultimate reasons that sustain them- to specialized and non-specialized publics in a clear and unambiguous way.
B16	G11 - Possess the learning skills that allow to continue studying in a self-directed or autonomous way.
C1	ABET (a) - An ability to apply knowledge of mathematics, science, and engineering.
C2	ABET (b) - An ability to design and conduct experiments, as well as to analyze and interpret data.
C3	ABET (c) - An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.
C5	ABET (e) - An ability to identify, formulate, and solve engineering problems.
C6	ABET (f) - An understanding of professional and ethical responsibility.
C7	ABET (g) - An ability to communicate effectively.
C8	ABET (h) - The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
C9	ABET (i) - A recognition of the need for, and an ability to engage in life-long learning.
C11	ABET (k) - An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Modelling and analysis of mechanical and structural systems	AJ19	BJ1 BJ2 BJ3 BJ4 BJ5 BJ6 BJ7 BJ13 BJ14 BJ15 BJ16	CJ1 CJ2 CJ3 CJ5 CJ6 CJ7 CJ8 CJ9 CJ11
Simulation of mechanical and structural systems	AJ19	BJ1 BJ2 BJ3 BJ4 BJ5 BJ6 BJ7 BJ13 BJ14 BJ15 BJ16	CJ1 CJ2 CJ3 CJ5 CJ6 CJ7 CJ8 CJ9 CJ11

Contents	
Topic	Sub-topic
Topic 1. The finite element method.	The finite element method. Approach for statics and dynamics. Imposition of constraints
Topic 2. Modelling of systems	Modelling of systems. Families of finite elements. Continuous and structural elements
Topic 3. Simulation	Modelling of geometry and mechanical properties. Assembly. Imposition of constraints Interactions. Imposition of loads and boundary conditions. Problem solving and evaluation of results.

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Seminar	A19 B1 B4 B5 B6	5	10	15
Laboratory practice	A19 B2 B3 B5 B13 B15 B14 B16 B7 B6 C1 C2 C3 C5 C6 C7 C8 C9 C11	5	10	15
Supervised projects	A19 B2 B3 B5 B13 B15 B14 B16 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	10	30	40
Guest lecture / keynote speech	A19 B1 B4 B5 B6	10	30	40
Personalized attention		2.5	0	2.5

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

Methodologies	
Methodologies	**Description**
Seminar	Técnica de traballo en grupo para resolver problemas, mediante exposición, discusión, participación e cálculo. Emprégase calculadora.
Laboratory practice	Metodoloxía que permite a realización de actividades de carácter práctico con computador, tales como modelización, análise e simulación de elementos mecánicos e estruturais
Supervised projects	Metodoloxía deseñada para promover a aprendizaxe autónoma dos estudantes, resolvendo un problema que involucre o conter da materia e involucre as competencias específicas da mesma, realizado baixo a tutela do profesor Alternativamente proponse un traballo tutelado no ámbito do aprendizaxe-servizo, que combina o servizo á comunidade coa aprendizaxe nun só proxecto, no que o alumnado se forma traballando en necesidades reais da súa contorna co fin de melloralo
Guest lecture / keynote speech	Exposición oral complementada co uso de medios audiovisuais, que ten como finalidade transmitir coñecementos e facilitar a aprendizaxe da materia

Personalized attention	
Methodologies	**Description**
Laboratory practice Supervised projects	Monitoring and guidance on the solution of specific problems arising in the development of the different activities proposed in the course. Assistance in carrying out the tutored work.

Assessment			
Methodologies	**Competencies / Results**	**Description**	**Qualification**
Laboratory practice	A19 B2 B3 B5 B13 B15 B14 B16 B7 B6 C1 C2 C3 C5 C6 C7 C8 C9 C11	Students must systematically attend the practicals and prepare them during the practical sessions of the subject and in the non-classroom hours assigned. The work carried out is monitored during these practical sessions. The evaluation is carried out through the presentation of the reports of these practical sessions.	30
Supervised projects	A19 B2 B3 B5 B13 B15 B14 B16 B7 B6 C1 C3 C5 C6 C7 C8 C9 C11	The work involves the theoretical and practical contents developed in the subject. It must be done individually in the practical sessions throughout the course and at home, in the non-face-to-face hours assigned to this subject. The work will be monitored during the practical sessions. The assessment is carried out through the presentation of the tutored work.	70

Assessment comments

Academic dispensation is accepted. Students whose presence during the four-month period is insufficient to monitor their work will still have to prepare and present the lab practices and the tutored work for assessment. The monitoring of this work will be carried out in the tutorial sessions. In this case, the assessment process of the subject may include, in addition to the presentation of the lab practices and the tutored work, an individual or group session, in which the student solves the problems set by the teacher manually and/or with the computer.
For the second opportunity, the student can present the pending work and improve thework already done. Follow-up is carried out in tutorial sessions. The evaluation is carried out by means of the presentation of the laboratory practices and of the pending and/or improved tutored work. The assessment process of the subject may include, in addition to the presentation of the laboratory practices and the tutored work, an individual or group session, in which the student solves the problems manually and/or with the computer. The evaluation criteria for the early December call will be the same as those for the second opportunity of the previous academic year.Proven
fraud in any work, test or evaluation activity will directly lead to a failing
grade of "0" in the work, test or evaluation activity in question,
without the option to resubmit it in the extraordinary or advanced call

Sources of information	
Basic	- R. Gutiérrez, E. Bayo, A. Loureiro, LE Romera (2010). Estructuras II. Reprografía del Noroeste. Santiago de Compostela - Bathe K.J. (2006). Finite Elements Procedures. Prentice-Hall, Pearson Education, Inc. USA - Eugenio Oñate (1995). Calculo de estructuras por el método de elementos finitos. CIMNE, Barcelona, España - Dassault Systèmes Simulia Corp. (2011). Abaqus Analysis User?s Manual. © Dassault Systèmes. Providence, RI, USA.
Complementary	

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
Para axudar a conseguir unha contorna inmediata sostida e cumprir co obxectivo da acción número 5: ?Docencia e investigación saudable e sustentable ambiental e social? do "Plan de Acción Green Campus Ferrol"A entrega dos traballos documentais que se realicen nesta materia:Solicitaranse en formato virtual e/ou soporte informáticoRealizarase a través de Moodle, en formato dixital sen necesidade de imprimilosEn caso de ser necesario realizalos en papel:Non se empregarán plásticosRealizaranse impresións a dobre cara.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.