UNIVERSIDADE DA CORUÑA

Teaching Guide				
Identifying Data				2022/23
Subject (*)	Structures 2		Code	630G02023
Study programme	Grao en Estudos de Arquitectura			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	1st four-month period	Third	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Construcións e Estruturas Arquitectónicas, Civís e AeronáuticasEnxeñaría Civil			
Coordinador	Muñoz Vidal, Manuel	E-mail	manuel.munoz@udc.es	
Lecturers	Muñoz Vidal, Manuel Tabernero Duque, Fernando Maria	E-mail	manuel.munoz@udc.es fernando.tabernero@udc.es	
Web				
General description	Calculation basis. Actions in the building. Energy methods. Structural analysis using the matrix method. Structural analysis using the finite element method. Computational computing applications.			

Study programme competences	
Code	Study programme competences
A7	"Knowledge of the principles of general mechanics, statics, mass geometry and vector and tensor fields, adapted and applied to architecture and urbanism "
A72	Coñecemento avanzado de aspectos específicos da materia de Estruturas no contemplados expresamente na Orde EDU/2075/2010
B1	Students have demonstrated knowledge and understanding in a field of study that is based on the general secondary education, and is usually at a level which, although it is supported by advanced textbooks, includes some aspects that imply knowledge of the forefront of their field of study
B3	Students have the ability to gather and interpret relevant data (usually within their field of study) to inform judgements that include reflection on relevant social, scientific or ethical issues
B5	Students have developed those learning skills necessary to undertake further studies with a high level of autonomy
B9	Understanding the problems of the structural design, construction and engineering associated with building design and technical solutions
C6	Critically evaluate the knowledge, technology and information available to solve the problems they must face

Learning outcomes			
Learning outcomes	Study programme competences		
Knowledge of the bases of structural calculation.	A7 A72	B1 B3	C6
Evaluation of actions in building.	A72	B1 B3	
Numerical and computer methods of structural analysis.	A72	B9	C6
The student will acquire aptitudes for the pre-dimensioning, design, calculation and verification of structures and to direct their material execution	A7 A72	B1 B3 B5 B9	C6

Contents

Topic	Sub-topic
01 ACTIONS IN THE BUILDING	1 Permanent actions. CTE-DB SE-AE 2 Permanent actions: Land action. CTE-DB SE-C 3 Variable use and climatic actions. CTE-DB SE-AE 4 Consideration of actions in accidental situations: CTE-DB SE and NCSE-02 5 Combination of actions
02 ENERGY METHODS	1 Clapeyron's Law. 2 Axial deformation, bending and cutting work. 3 Castigliano's theorems. 4 Mohr-Maxwell unit load method. 5 Menabrea's Minimum Work Theorem.
03 THE MATRIX METHOD	1 Idealizations for calculation 2 Methods of matrix analysis. Flexibility and Rigidity 3 The Rigidity method 4 Flat structures 5 Compatibility and balance 6 Links and Boundary Conditions 7 Reactions and efforts
04 THE FINITE ELEMENT METHOD	1 General principles. 2 Constitutive equation. 3 Interpolation functions. 4 Isoparametric formulation 5 Flat stress and strain. 6 Element balance
05 ANALYSIS OF STRUCTURES BY COMPUTER	1 Topological definition of structures in software 2 Accurate data entry - sequencing 3 Calculation with general numerical calculation software. 4 Matrix and finite element calculation software. 5 Problems and limitations of the software.
06 CALCULATION BASIS	1 Structural analysis. Limit states. 2 The probabilistic concept of failure. 3 Method of Partial Coefficients. 4 Combination of actions. Hypothesis.

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A7 A72 B5	14	28	42
Problem solving	B1 C6	24	36	60
Practical test:	B3 B9	6	12	18
Objective test	B1 B3 C6	4	20	24
Seminar	A72 B9 C6	1	1	2
Directed discussion	B1	1	1	2
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	They are taught for the whole group. In them, the aspects that are considered necessary for the development of the subject are developed.

Problem solving	Practical resolution of problems related to the subject. This resolution can be made by the teacher, by the students or in a mixed way.
Practical test:	Resolution of practical exercises of the subject, of individual success, with a limited time, we can consult punctual doubts with the teacher. Only class notes and forms can be used.
Objective test	Resolution of theoretical and practical exercises of the subject, of individual success, with limited time. Only class notes and forms can be used.
Seminar	Development of special classes to focus on any of the proposed practices.
Directed discussion	Discussion of theoretical issues

Personalized attention	
Methodologies	**Description**
Practical test:	Direct attention to the student for the focus of the practical exercises and for the discussion and solution of theoretical doubts and resolution of problems

Assessment			
Methodologies	**Competencies**	**Description**	**Qualification**
Practical test:	B3 B9	They are called Bulletins or problem solving tests to be carried out by the student throughout the course. Class notes and the form sheet are allowed. Specific doubts can be consulted with the teacher.	20
Objective test	B1 B3 C6	Final test of the first opportunity. (In the second opportunity computes 100% of the note). Class notes and the form sheet are allowed. It will consist of the resolution of practical problems, as well as theoretical questions based on the material given in the theoretical classes and exercises carried out. will also be valued - Content structuring - Approach, clarity and precision - Mastery of the operation of the matter	80

Assessment comments

The evaluation will be as continuous as possible. For the evaluation and qualification of the subject, the following aspects will be assessed, which will have a different weight in the final grade of the course, as broken down in the previous Table that appears in the evaluation section:
* Attendance to class is understood as compulsory, verified through a list or another system.
* Interactive practices will be developed, where the student will be able to consult the doubts that arise.
* Throughout the course a continuous practice will be developed, directed and proposed by the teachers and that the students must develop and complete independently.
* When the qualification consists of several sections, a
minimum grade of 35% (3.5 out of 10) will be required in
each of the sections to be evaluated either on the first or second opportunity. Once this minimum is exceeded, the sections will average according to the
weights indicated in the guide. In the event that in any section the minimum is not reached to make an average, the grade awarded will be the weighted average, but without ever exceeding
4.5.
* Throughout the course there will be a
partial test, which will consist of problem-type questions, and may also have conceptual issues. It will be liberatory of matter in the face of the first opportunity.
* The objective tests will be individual and you will not be able to consult any bibliography. During its development, only the consultation of a summary form will be allowed.
* At the first final opportunity of the course, an
objective test will be carried out (those who have passed the partial will have fewer questions to answer)
* At the
first opportunity, the three sections will average according to the
weights indicated in the previous table..
* In the so-called second opportunity at the end of the course, it will be evaluated through the objective test and a new supervised work similar to that developed during the course. The only requirement to be able to take this final test will be to appear in the minutes of this course. In this case, the subject score will be 60% the objective test and 40% the new supervised work. (The minimum 40% grade is still required in each section to qualify for the pass).
* In the case of students who have a waiver of attendance and who can therefore present themselves at the first and second opportunity without requiring continuous evaluation, the assessment will be similar to the second general opportunity on both occasions: 60% the objective test and 40% the supervised work. (The minimum 40% grade is still required in each section to qualify for the pass). It is understood that the supervised work of the first and second opportunity will be the same as for the rest of the students.
For the realization of practices and examination, the allowed materials will only be:
- DNI or other identification- Writing and drawing material and Calculator- A summary sheet of formulas- Mobile phones are expressly prohibited
Teaching to students of mobility programs will be adapted to pedagogical conditions and special supervised work, as well as assessment tests and exams. If the mobility dates do not allow a reasonable follow-up of the course, they may opt in any case for the first and second opportunity exams on the same conditions as the students with no attendance.

Sources of information	
Basic	

Complementary	1 RODRÍGUEZ MARTÍN, L. F. Curso de estructuras metálicas de acero laminado. Colegio Oficial deArquitectos . Madrid, 1984. _____ 2 AGUIAR FALCONI, R. Análisis Matricial deEstructuas. CEINCI, 3ª edición. 2004. 3 ALARCÓN ÁLVAREZ, E. - ÁLVAREZ CABAL, GÓMEZ LERA,Ma. S. Gómez Lera. Cálculo Matricial deEstructuras Ed. Reverté. 1990. 4 BRAY, K.H.M; CROXTON, P.C.L, MARTIN, L.H. Análisis Matricial deEstructuas. Paraninfo. 1978. _____ 5 BELTRÁN, FRANCISCO. Teoría General del Método delos Elementos Finitos. Notas de clase / Curso deDoctorado 1998-1999. Departamento de MecánicaEstructural y Construcciones Industriales. ETS Ingenieros industriales Madrid. 6 COOK, R. D. Finite Element Modeling forStress Analysis. John Wiley & Sons Inc.1995. 7 DE LA ROSA OLIVER, EMILIO. Modelos diferenciales ynuméricos en la Ingeniería. Métodos de Fourier; de diferencias y elementosfinitos. Ed. Bellisco. Madrid 1999. 8 FORNONS GARCÍA, JOSÉ MARÍA. El Método de los ElementosFinitos en la ingeniería de estructuras. Ed. Marcombo - UniversidadPolitécnica Barcelona. 9 HSIEH, Y. Teoría Elemental deEstructuras. Prentice Hall. 1979. 10 MARTÍ MONTRULL, P. Análisis de Estructuras. Horacio Escarbajal. 2ª ed.2007. 11 OÑATE, E. Cálculo de Estructuras porel Método de los Elementos Finitos. CIMNE. Barcelona. 1995 12 PRZEMIENIECKI, J. S. Theory of Matrix StructuralAnalysis. Mc Graw Hill. 1968.

Recommendations
Subjects that it is recommended to have taken before
Structures 1/630G01019 Mathematics for Architecture 2/630G02009 Physics for Architecture 1/630G02008
Subjects that are recommended to be taken simultaneously
Construction 3/630G01022
Subjects that continue the syllabus
Structures 3/630G01028
Other comments
Previamente recomendase un repaso da materia do curso anterior sobre a que setraballará reiteradamente, como é:- resolución de estructuras articuladas- diagramas de esforzos de vigas e pórticos- estado tensional do sólido- estado de deformacions- ley de Hooke xeralizadaPolo tratamento continuado da materia recomendase un repaso cada día deo tratado na clase, planteando as dudas que poidan surxir na próxima clase o nas horas de tutoría.Aparte do seguimento das clases, o alumno debe consultala bibliografía e material recomendado para cada parte da materia.