



Teaching Guide				
Identifying Data				2021/22
Subject (*)	Structures 1	Code	630G02019	
Study programme	Grao en Estudos de Arquitectura			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Construcións e Estruturas Arquitectónicas, Cívicas e Aeronáuticas Enxeñaría Civil			
Coordinador	Muñoz Vidal, Manuel	E-mail	manuel.munoz@udc.es	
Lecturers	Cuba Cabana, Hilda Muñoz Vidal, Manuel Taberero Duque, Fernando Maria	E-mail	hilda.cuba@udc.es manuel.munoz@udc.es fernando.taberero@udc.es	
Web				
General description	Knowledge Theory of Elasticity and Strength of Materials			
Contingency plan	<p>1. Changes in content: The contents are maintained.</p> <p>2. Methodologies * Teaching methodologies that are maintained All  * Teaching methodologies that are modified Depending on the possibilities or needs of the teaching, it can be in face-to-face, hybrid or non-face-to-face mode. In any case, the exhibition, interactive classes and / or supervised works will be adapted to the necessary online means, maintaining in any case the schedule assigned by the center.</p> <p>3. Mechanisms for personalized attention to students e-mail: Permanent for queries Moodle: Forums and Delivery of tasks Teams: Weekly in general for clarification of doubts and permanent for online tutoring, by appointment.</p> <p>4. Modifications in the evaluation The evaluation is already planned so that the same assessment criteria can be maintained, either face-to-face, hybrid or non-face-to-face.  * Evaluation observations: In the case of online mode, if during the objective test any technical problem arises, it will be immediately communicated to the teaching staff to fix a solution. Therefore it is recommended to have the mobile phone available with the mail application and operational Teams for these emergency notifications</p> <p>5. Modifications of the bibliography or webgraphy The initially indicated bibliography and webgraphy are maintained. All the documentation of the classes taught is provided in Moodle, as well as resolved examples on the topics developed.</p>			

Study programme competences / results	
Code	Study programme competences / results



Learning outcomes		
Learning outcomes	Study programme competences / results	
Knowledge of Elasticity, Plasticity and Strength of Materials. Indeterminate systems. Numerical and computer methods of structural analysis.	A56 A57 A58	B1 B2 B4 B5 B7 B11 B15 B21 B22 B24
The student will acquire skills for pre-dimensioning, design, calculation and testing of structures and to direct its material execution	A57 A58	B4 B5 B7 B15

Contents	
Topic	Sub-topic
01 STRUCTURE. REQUIREMENTS AND BEHAVIOR	1 Concept of Structure 2 Linear and Surface Structural Elements 3 Structural Systems 4 Balance and Stability 5 Strength and Rigidity 6 Design, Idealization and Analysis 7 Actions, Connections and Coercions.
02 STRESS STATE	1 Concept of tension. Components of the voltage vector. 2 Tensions depending on the orientation of the section. 3 Flat tension state. Tension Tensor 4 Intrinsic components of the Strain
03 STRAIN STATE	1 Deformations and displacements. Components 2 Flat deformational state. Strain tensor 3 Intrinsic Components of Strain
04 RELATION STRESS STRAIN	1 Elastic constants of materials 2 Generalized Hooke's Law 3 Lamé's Equations
05 STRENGTH OF MATERIALS	1 Solid elastic concept. Mechanical prism. 2 Bernoulli hypothesis and Saint-Venant principle. 3 Diagrams stress - deformation. 4 Failure criteria for Saint Venant and Tresca.
06 AXIAL FORCE	1 Uniaxial stress and strain states 2 Section resistance. 3 Resolution of hyperstatic monoaxial problems 4 Strength of the bars. Buckling. Euler's critical charge.
07 SHEAR FORCE	1 Elemental theory 2 Connecting elements 3 Pin calculation



08 PURE BENDING	<ul style="list-style-type: none"> <li>1 Hypothesis and general solution</li> <li>2 Simetric pure bending. Navier law. Resistant module</li> <li>3 Sections calculation</li> <li>4 Differential equations or the elastic line.</li> </ul>
09 SIMPLE BENDING	<ul style="list-style-type: none"> <li>1 Colignon formulation</li> <li>2 Principal stress. Isostatic</li> <li>3 Beams calculations</li> </ul>
10 DEVIED BENDING	<ul style="list-style-type: none"> <li>1 Normal and shear stresses</li> <li>2 Bend allowance</li> <li>3 Analysis of deformations</li> </ul>
11 BENDING (COMPOUND FLEXURE)	<ul style="list-style-type: none"> <li>1 Normal and shear stresses. Neutral axis</li> <li>2 Pressure center and neutral axis</li> <li>3 Central core or central nucleus. Concept. Determination.</li> </ul>
12 TORSION	<ul style="list-style-type: none"> <li>1 Simple torsion and pure torsion.</li> <li>2 Torsion in cylindrical bars. Coulomb theory.</li> <li>3 Torsion in no circular cross-section prisms</li> <li>4 Design consideration in elements with torsion</li> </ul>

**Planning**

Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	A56 A57 A58	29	29	58
Directed discussion	B1	1	1	2
Problem solving	A56 B2	15	30	45
Objective test	B2 B11	8	16	24
Supervised projects	B4 B5 B7 B11 B15 B21 B22 B24	2	10	12
Seminar	B24	2	3	5
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 given to the entire group. In these aspects considered necessary for the development of the field grow.
Directed discussion	Presentation and discussion of specific issues.
Problem solving	Practical problem solving related to the subject. This resolution can be carried out by the teacher, students or mixed form
Objective test	Individual practices throughout the course
Supervised projects	Development work throughout the course with teacher assistance
Seminar	Special class development to focus some of the practical proposals
Directed discussion	Discusión cuestiones teóricas

**Personalized attention**

Methodologies	Description
Supervised projects	Please direct students to the ward focus and work for discussion and solution of theoretical questions and troubleshooting

**Assessment**



Methodologies	Competencies / Results	Description	Qualification
Supervised projects	B4 B5 B7 B11 B15 B21 B22 B24	CONTINUED PRACTICE - Work planning and tutoring assistance - Original Contributions - Structure and presentation - Quality of documentation	30
Objective test	B2 B11	PARTIAL/FINAL TEST - Troubleshooting - Mastery of theoretical knowledge - Structuring content - Planning, clarity and precision - Mastering the art of operational	60
Problem solving	A56 B2	BULLETIN PRACTICES. - Realization of practical cases - Attendance and active participation in class - Application of knowledge acquired in the bulletins.	10

#### 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

<b>Basic</b>	
<b>Complementary</b>	1 BEDFORD, A.; LIECHTI, K. M. Mecánica de materiales. Prentice-Hall Inc. Pearson Educación de Colombia Ltda. Bogotá, 2002. 2 BYARS, E. F.; SNYDER, R. D. Mecánica de cuerpos deformables. Representación y Servicios de Ingeniería S.A. México, 1978. 3ª edición. 3 GERE, J. M. Timoshenko. Resistencia de materiales. Thomson. Madrid, 2002. 5ª edición. 4 GONZÁLEZ TABOADA, J.A. Tensiones y deformaciones en materiales elásticos. Universidad de Santiago de Compostela, 1989. 5 ORTIZ BERROCAL, L. Elasticidad. Universidad Politécnica de Madrid. Madrid, 1985. 6 HIBBELER, R. C. Mecánica de materiales. Prentice Hall Hispanoamericana S.A. México, 1998. 3ª edición. 7 ORTIZ BERROCAL, L. Resistencia de materiales. McGraw-Hill. Madrid, 2002. 2ª edición (1ª edición de 1980). 8 POPOV, E. P.; BALAN, T. A. Mecánica de sólidos. Pearson Educación. México, 2000. 2ª edición.

## Recommendations

### Subjects that it is recommended to have taken before

Mathematics for Architecture 1/630G02004  
Mathematics for Architecture 2/630G02009  
Physics for Architecture 1/630G02008

### Subjects that are recommended to be taken simultaneously

Construction 2/630G02020

### Subjects that continue the syllabus

Structures 3/630G02028  
Structures 2/630G02023

### Other comments

Previously reviewed the matter on which previous course work repeatedly, as is recommended: &nbsp;- Geometry mass &nbsp;- Resolution of articulated structures &nbsp;- Diagrams efforts beams and frames &nbsp;- Given the continuous treatment of the subject, a daily review of the subject dealt with in the class is recommended, which will allow to raise the doubts that could arise in the next class or in an individualized way in the tutoring hours. Apart from the monitoring of the classes, it is necessary to consult the bibliography and the recommended material for each part of the subject, where you can find references that complement and reinforce the theme raised from different points of view that add to the training work.

(\*) 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.