



## Teaching Guide

Identifying Data					2019/20
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				
Coordinator	Muñoz Vidal, Manuel	E-mail	manuel.munoz@udc.es		
Lecturers	Cuba Cabana, Hilda Muñoz Vidal, Manuel Suárez Riestra, Félix Leandro Taberner Duque, Fernando Maria	E-mail	hilda.cuba@udc.es manuel.munoz@udc.es felix.suarez@udc.es fernando.taberner@udc.es		
Web					
General description	Knowledge Theory of Elasticity and Strength of Materials				

### 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 Structure and Structural System 3 Balance, resistance and Stability 4 Concept of rigidity 5 Behavior Requirements 6 Process. From Design to Analysis



02 STRUCTURAL ELEMENTS	<ul style="list-style-type: none"> <li>1 Linear Elements</li> <li>2 Surface Elements</li> <li>3 Structural Systems</li> <li>4 Idealization. Model</li> </ul>
03 BALANCE ACTION AND COACTION	<ul style="list-style-type: none"> <li>1 System and Formal Permanence</li> <li>2 Exterior-Interior Action. Balance</li> <li>3 The Connection. Rigidity of the Union</li> <li>4 Foreign Coactions. Reactions and Displacement</li> </ul>
04 STRESS AND STRAIN	<ul style="list-style-type: none"> <li>1 Tension concept: Normal and tangential</li> <li>2 Components of the voltage vector</li> <li>3 Tensions depending on the orientation of the section.</li> <li>4 Flat tensional state. Tension tensor</li> <li>5 Specific and angular deformations</li> <li>6 Flat deformation state. Deformation tensioner</li> </ul>
05 RELATION STRESS - STRAIN	<ul style="list-style-type: none"> <li>1 Elastic constants of the materials</li> <li>2 Hooke's law</li> <li>3 Lamé equations</li> </ul>
06 MATERIALS RESISTANCE	<ul style="list-style-type: none"> <li>1 Concept of elastic solid. Mechanical prism.</li> <li>2 Bernoulli hypothesis and Saint-Venant principle.</li> <li>3 Diagrams tension - deformation.</li> </ul>
07 AXIAL FORCE	<ul style="list-style-type: none"> <li>1 Stress conditions and uniaxial deformational conditions</li> <li>2 Strength of bars</li> <li>3 Resolution of monoaxial hyperstatic problems</li> <li>4 Introduction of the buckling problems. Euler critical load.</li> </ul>
08 SHEAR FORCE	<ul style="list-style-type: none"> <li>1 Elemental theory</li> <li>2 Connecting elements</li> <li>3 Smugglers calculation</li> </ul>
09 PURE BENDING	<ul style="list-style-type: none"> <li>1 Hypothesis or assumptions and general solutions</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>
10 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>
11 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>
12 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>
13 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 PRACTICES - Participation and collaboration in group - Original Contributions - Structure and presentation - Quality of documentation	10
Objective test	B2 B11	PARTIAL TEST - Troubleshooting - Mastery of theoretical knowledge - Structuring content - Planning, clarity and precision - Mastering the art of operational	80
Problem solving	A56 B2	INTERACTIVE PRACTICE - Attendance and active participation in class - Carrying out practical - Application of knowledge acquired	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 detailed in the previous Table that appears in the evaluation section:

- \* The attendance to class is understood compulsory verifying by means of list or another system.
- \* Interactive practices will be developed in class, where the student can consult the doubts that arise.
- \* Throughout the course a series of sequential practices directed and raised by the teachers will be developed and that the students will have to develop and complete in an autonomous way. The approach and start of each work is carried out in groups of students, in order to foster organizational capacity and a collaborative attitude. A minimum final score of 3 points must be obtained in order to qualify for the passing grade per course.
- \* Throughout the course a series of partial tests will be carried out, which will consist of problem-type issues, and may also have conceptual issues. They will be individual and you will not be able to consult any bibliography. During its development, only a summary form will be allowed to be consulted. You must obtain a minimum score of 3 points in each of the tests to be eligible for the passing grade per course.
- \* Exceeding satisfactorily the previous aspects, it will be possible to obtain the approved of the course without having to go to any of the final tests. Students enrolled in 2nd enrollment or later, must follow the course in the same conditions as the first enrollment to be eligible for the approved course.
- \* If the subject is not passed per course, the written test that includes the first final opportunity of the course will be taken. The result of this test will count as the partial tests during the course, maintaining the valuation of the interactive and continuous practices. A minimum score of 3 points will continue to be required in continued practice to qualify for the pass.
- \* In the case of students who have dispensation of assistance and therefore can be presented at this first opportunity if having specified the continuous assessment, the assessment of this written test and therefore the subject, will depend exclusively on the grade obtained in this test.
- \* In the so-called second opportunity at the end of the course, a written test or exam will be developed. The only requirement to be able to take this final test will be in the minutes of this subject. In this case the score of the subject will depend solely on the grade obtained in this test.

For the experiments and examination materials will be permitted only:

- ID card or other identification
- Material of writing and drawing
- Calculator
- A summary sheet of formulas
- Mobile phones is expressly prohibited

The offset will consider structuring content, order submission and accuracy of results. Take into account the errors of concepts generally considered very serious, and may nullify the whole exercise.

### Sources of information

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

### Recommendations

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

Mathematics I/670G01001

Applied Physics I/670G01002

#### Subjects that are recommended to be taken simultaneously



Mathematics II/670G01006

Construction I/670G01009

**Subjects that continue the syllabus**

Structures II/670G01025

Structures III/670G01034

**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.**