



Teaching Guide				
Identifying Data				2019/20
Subject (*)	Strength of Materials	Code	730G03013	
Study programme	Grao en Enxeñaría Mecánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatory	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Naval e Industrial			
Coordinador	Reinosa Prado, Jose Manuel	E-mail	j.reinosa@udc.es	
Lecturers	Gutierrez Fernandez, Ruth Maria Loureiro Montero, Alfonso Reinosa Prado, Jose Manuel	E-mail	ruth.gutierrez@udc.es a.loureiro@udc.es j.reinosa@udc.es	
Web	sites.google.com/site/structuralanalysislab/			
General description	Mechanics of Materials is the basis for the structural analysis and design of mechanical elements. The concepts of stress and strain are explained and discussed. Axial and shear stresses are dealt with as well as torsion and beams bending.			

Study programme competences / results	
Code	Study programme competences / results
A14	CR8 - Coñecemento e utilización dos principios da resistencia de materiais.
B2	CB02 - Que os estudantes saiban aplicar os seus coñecementos ao seu traballo ou vocación dunha forma profesional e posúan as competencias que adoitan demostrarse por medio da elaboración e defensa de argumentos e a resolución de problemas dentro da súa área de estudo
B3	CB03 - Que os estudantes teñan a capacidade de reunir e interpretar datos relevantes (normalmente dentro da súa área de estudo) para emitiren xuízos que inclúan unha reflexión sobre temas relevantes de índole social, científica ou ética
B5	CB05 - Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía
B6	B3 - Ser capaz de concibir, deseñar ou poñer en práctica e adoptar un proceso substancial de investigación con rigor científico para resolver calquera problema formulado, así como de comunicar as súas conclusións ?e os coñecementos e razóns últimas que as sustentan? a un público tanto especializados como leigo dun xeito claro e sen ambigüidades
B7	B5 - Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas
B9	B8 - Adquirir unha formación metodolóxica que garanta o desenvolvemento de proxectos de investigación (de carácter cuantitativo e/ou cualitativo) cunha finalidade estratéxica e que contribúan a situarnos na vangarda do coñecemento
C1	C3 - Utilizar as ferramentas básicas das tecnoloxías da información e as comunicacións (TIC) necesarias para o exercicio da súa profesión e para a aprendizaxe ao longo da súa vida.
C2	C4 - Desenvolverse para o exercicio dunha cidadanía aberta, culta, crítica, comprometida, democrática e solidaria, capaz de analizar a realidade, diagnosticar problemas, formular e implantar solucións baseadas no coñecemento e orientadas ao ben común.
C3	C5 - Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.
C4	C6 - Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C5	C7 - Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
C6	C8 - Valorar a importancia que ten a investigación, a innovación e o desenvolvemento tecnolóxico no avance socioeconómico e cultural da sociedade.

Learning outcomes	
Learning outcomes	Study programme competences / results



Coñecer e utilizar os principios da resistencia dos materiais	A14	B2 B3 B5 B6 B7 B9	C1 C2 C3 C4 C5 C6
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Contents	
Topic	Sub-topic
Os bloques ou temas seguintes desenrolan os contidos establecidos na ficha da Memoria de Verificación:	Carga axial; esforzos, tensións e deflexións en vigas; estados planos; tensión.
1. Tension, Compression and Shear	Introduction to Mechanics of Materials Normal Stress and Strain Mechanical Properties of Materials Elasticity, Plasticity, and Creep Linear Elasticity, Hooke's Law, and Poisson's Ratio Shear Stress and Strain Allowable Stresses and Allowable Loads Design for Axial Loads and Direct Shear
2. Axially Loaded Members	Introduction Changes in Lengths of Axially Loaded Members Changes in Lengths Under Nonuniform Conditions Statically Indeterminate Structures Thermal Effects, Misfits, and Prestrains Stresses on Inclined Sections Strain Energy
3. Torsion.	Introduction Torsional Deformations of a Circular Bar Circular Bars of Linearly Elastic Materials Stresses and Strains in Pure Shear Relationship Between Moduli of Elasticity E and G Transmission of Power by Circular Shafts Strain Energy in Torsion and Pure Shear
4. Shear Force and Bending Moment	Introduction Types of Beams, Loads, and Reactions Shear Forces and Bending Moments Relationships Between Loads, Shear Forces, and Bending Moments Shear-Force and Bending-Moment Diagrams
5. Stresses in Beams I.	Introduction Pure Bending and Nonuniform Bending Curvature of a Beam Longitudinal Strains in Beams Normal Stresses in Beams (Linearly Elastic Materials) Design of Beams for Bending Stresses
6. Stresses in Beams II.	Shear Stresses in Beams of Rectangular Cross Section Shear Stresses in Beams of Circular Cross Section Shear Stresses in the Webs of Beams with Flanges



7. Analysis of Stress and Strain	<p>Introduction</p> <p>Plane Stress</p> <p>Principal Stresses and Maximum Shear Stresses</p> <p>Mohr's Circle for Plane Stress</p> <p>Hooke's Law for Plane Stress</p> <p>Triaxial Stress</p> <p>Plane Strain</p>
8. Deflections of Beams	<p>Introduction</p> <p>Differential Equations of the Deflection Curve</p> <p>Deflections by Integration of the Bending-Moment Equation</p> <p>Deflections by Integration of the Shear-Force and Load</p> <p>Deflections by the Virtual Force Method</p> <p>Strain Energy of Bending. Thermal effects.</p>

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student's personal work hours	Total hours
Guest lecture / keynote speech	A14 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	24	39	63
Problem solving	A14 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	24	12	36
Laboratory practice	A14 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	8	16	24
ICT practicals	A14 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	0	10	10
Mixed objective/subjective test	A14 B2 B3 B7 C4 C5	4	6	10
Personalized attention		7	0	7

(\*)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	Oral lecture supplemented with the use of audiovisual means, aiming at transmit knowledges and facilitate the learning within the scope of structural analysis.
Problem solving	Technique of work in group to resolve practical cases, by means of exhibition, discussion, participation and calculation. It employed calculator.
Laboratory practice	Methodology that allows the realization of activities of practical character, with computer, such as modelization, analysis and simulation of mechanical and estructural elements, as well as experimental studies in the workshop of structures, for studying its deformation and resistance.
ICT practicals	Practicas a través da plataforma Moodle.
Mixed objective/subjective test	Test writing used for the evaluation of the learning.

Personalized attention	
Methodologies	Description



Problem solving Laboratory practice	Monitoring and guidance in the possible problems appearing during the academic activities.
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Assessment			
Methodologies	Competencies / Results	Description	Qualification
Laboratory practice	A14 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	The attendance is mandatory.	10
Mixed objective/subjective test	A14 B2 B3 B7 C4 C5	Final examination	70
ICT practicals	A14 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	Prácticas utilizando a plataforma Moodle.	20

Assessment comments
<p>Os alumnos con dispensa académica quedan eximidos da asistencia a clase, que, por outro lado, non é obrigatoria tampouco para os alumnos con dedicación a tempo completo. O sistema de avaliación é análogo ó dos alumnos a tempo completo.</p> <p>Os criterios de avaliación da segunda oportunidade son os mesmos que os da primeira oportunidade.</p>

Sources of information	
<b>Basic</b>	<ul style="list-style-type: none"> <li>- Gere James M.; Tmoshenko (2002). Resistencia De Materiales. Quinta edición.. Editorial Paraninfo, Madrid.</li> <li>- Hibbeler, Russell C. Traducción José de la Cera Alonso, Virgilio González y Pozo. (2006). Mecánica de materiales. Sexta edición.. Pearson Educación, México.</li> <li>- (). .</li> </ul>
<b>Complementary</b>	<ul style="list-style-type: none"> <li>- Ortiz Berrocal, Luis. (). Resistencia de materiales. . McGraw-Hill, Madrid, ESPAÑA, 2007.</li> <li>- Craig, Roy R. (2002). Mecánica de materiales. . Compañía Editorial Continental, México.</li> <li>- Ferdinand P. Beer et al. (2009). Mecánica de materiales. Quinta edición.. Mc Graw-Hill, México, Madrid.</li> </ul>

Recommendations
<b>Subjects that it is recommended to have taken before</b>
Calculus /730G03001 Physics I /730G03003 Linear Algebra/730G03006 Physics II/730G03009
<b>Subjects that are recommended to be taken simultaneously</b>
<b>Subjects that continue the syllabus</b>
Theory of Structures /730G03021 Strength of Materials II/730G03027 Tecnology and Design of Structures/730G03071 Structural Typologies/730G03070 FEM of Structures/730G03069

