



Teaching Guide

Teaching Guide				
Identifying Data				2015/16
Subject (*)	RESISTENCIA DOS MATERIAIS		Code	730G03013
Study programme	Grao en Enxeñaría Mecánica			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Second	Obligatoria	6
Language	Galician			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Industrial 2			
Coordinador	Reinosa Prado, Jose Manuel		E-mail	j.reinosa@udc.es
Lecturers	Gutierrez Fernandez, Ruth Maria		E-mail	ruth.gutierrez@udc.es
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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

Code	Study programme competences
A14	Coñecemento e utilización dos principios da resistencia de materiais.
A23	Coñecementos e capacidades para aplicar os fundamentos da elasticidade e resistencia de materiais ao comportamento de sólidos reais.
A24	Coñecementos e capacidade para o cálculo e deseño de estruturas e construcións industriais.
B2	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	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	Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía
B6	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	Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas
B9	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	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	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	Entender a importancia da cultura emprendedora e coñecer os medios ao alcance das persoas emprendedoras.
C4	Valorar criticamente o coñecemento, a tecnoloxía e a información dispoñible para resolver os problemas cos que deben enfrontarse.
C5	Asumir como profesional e cidadán a importancia da aprendizaxe ao longo da vida.
C6	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
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Adquirir os conceptos de elasticidade e inelasticidade.	A14	B2	C1
	A23	B3	C2
	A24	B5	C3
		B6	C4
		B7	C5
		B9	C6
Comprender o comportamento resistente das estruturas e elementos mecánicos, facendo propios os conceptos de tensión e deformación.	A14	B2	C1
	A23	B3	C2
	A24	B5	C3
		B6	C4
		B7	C5
		B9	C6
Análise e deseño de membros estruturales suxeitos a tracción, compresión, torsión e flexión.	A14	B2	C1
	A23	B3	C2
	A24	B5	C3
		B6	C4
		B7	C5
		B9	C6

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

Planning				
Methodologies / tests	Competencies	Ordinary class hours	Student's personal work hours	Total hours
Guest lecture / keynote speech	A14 A23 A24 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	24	36	60
Seminar	A14 A23 A24 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	18	18	36
Laboratory practice	A14 A23 A24 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	6	6	12
Objective test	A14 A23 A24 B2 B3 B7 C4 C5	3	12	15
Objective test	A14 A23 A24 B2 B3 B7 C5 C4	3	12	15
Personalized attention		12	0	12
(*)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.
Seminar	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 structural elements, as well as experimental studies in the workshop of structures, for studying its deformation and resistance.
Objective test	Test writing used for the evaluation of the learning.
Objective test	Test writing used for the evaluation of the learning.

Personalized attention

Methodologies	Description
Seminar Laboratory practice	Monitoring and guidance in the possible problems appearing during the academic activities.

Assessment

Methodologies	Competencies	Description	Qualification
Laboratory practice	A14 A23 A24 B2 B3 B5 B6 B7 B9 C1 C2 C3 C4 C5 C6	The attendance is mandatory.	5
Objective test	A14 A23 A24 B2 B3 B7 C5 C4	Final examination.	70
Objective test	A14 A23 A24 B2 B3 B7 C4 C5	Partial examination	25

Assessment comments

Sources of information

Basic	- Gere James M.; Tmoshenko (2002). Resistencia De Materiales. Quinta edición.. Editorial Paraninfo, Madrid. - Hibbeler, Russell C. Traducción José de la Cera Alonso, Virgilio González y Pozo. (2006). Mecánica de materiales. Sexta edición.. Pearson Educación, México. - (). .
Complementary	- Ortiz Berrocal, Luis. (). Resistencia de materiales. . McGraw-Hill, Madrid, ESPAÑA, 2007. - Craig, Roy R. (2002). Mecánica de materiales. . Compañía Editorial Continental, México. - Ferdinand P. Beer et al. (2009). Mecánica de materiales. Quinta edición.. Mc Graw-Hill, México, Madrid.

Recommendations

Subjects that it is recommended to have taken before

CÁLCULO/730G03001
FÍSICA I/730G03003
ÁLXEBRA/730G03006
FÍSICA II/730G03009

Subjects that are recommended to be taken simultaneously

Subjects that continue the syllabus



ESTRUTURAS/730G03021

RESISTENCIA MATERIAIS II/730G03027

ESTRUTURAS METÁLICAS/730G03035

ESTRUTURAS II/730G03036

ESTRUTURAS DE FORMIGÓN/730G03037

VIBRACIÓNS/730G03040

Other comments

(*)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.