

## SUBJECT TEACHING GUIDE

### G994 - Materials, Elasticity and Strength of Materials

Degree in Industrial Electronic Engineering and Automatic Control Systems  
 First Degree in Industrial Electronic Engineering and Automatic Control Systems

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Industrial Electronic Engineering and Automatic Control Systems First Degree in Industrial Electronic Engineering and Automatic Control Systems			Type and Year	Compulsory. Year 3 Compulsory. Year 2
Faculty	School of Industrial Engineering and Telecommunications				
Discipline	Subject Area: Materials, Elasticity and Strength of Materials Module in Common with the Industrial Branch				
Course unit title and code	G994 - Materials, Elasticity and Strength of Materials				
Number of ECTS credits allocated	6	Term	Semester based (1)		
Web					
Language of instruction	Spanish	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. INGENIERIA ESTRUCTURAL Y MECANICA				
Name of lecturer	ALBERTO DIEZ IBARBIA				
E-mail	alberto.diez@unican.es				
Office	E.T.S. de Ingenieros Industriales y de Telecomunicación. Planta: - 2. DESPACHO (S2046)				
Other lecturers	CESAR MORENO SIERRA				

### 3.1 LEARNING OUTCOMES

- To recognize the strengths and weaknesses of the different methodologies studied
- To be able to select materials for a certain application taking into account the materials' mechanical, electrical and magnetic properties.

#### 4. OBJECTIVES

To be familiar with the procedures used to determine the stress, strain and deformation in structural elements.

To be able to design structural elements

To know the structure, properties and applications of electrical and magnetic materials commonly used in the industry.

#### 6. SUBJECT PROGRAM

##### CONTENTS

1	Materials in electrical and electronic engineering. Introduction: Structure of materials. Atomic structure. Ionic bond. Covalent bond.
1.1	Electrical properties - Electrical conductivity. Conductors. Semiconductors (intrinsic and extrinsic). Dielectrics. Thermoelectric properties. Piezoelectricity. Ferroelectricity. Superconductivity.
1.2	Magnetic properties - Origin of magnetism. Diamagnetism and paramagnetism. Ferromagnetism. Magnetic domains. Hysteresis loops. Other magnetic behavior. Materials for industrial use. Magnetic glasses.
2	Elasticity and Strength of Materials. Introduction. Elasticity - loads and stresses. Stress state. Plane stress state. Variation of stresses on inclined planes. Principal stresses. Variation of shear stress on inclined planes. Mechanical properties of sections (centers of mass and moments of inertia)
2.1	TENSILE STRESS- Yield point. Hooke's law. Shear modulus. Poisson's ratio. Relationship between the elastic constants. Calculation of stresses and strains.
2.2	SHEAR, TORSION. Shear strength equation. Calculation and design of joints under shear. Simple torsion. Torsional stresses. Proportionality of stresses. Torsion strength equation.
2.3	BENDING - Strength formula. Navier formula. Modulus. Shear stress. Radius of curvature. Mohr theorems. Calculation of stresses and strains.

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
First Part Test	Written exam	No	Yes	50,00
Second Part Test	Written exam	Yes	Yes	50,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
The used evaluation system agrees with Universidad de Cantabria legislation. The final grade of the course will be the result of the weighting of the different grades obtained in each of the blocks. When the result is less than 5.00 points or in any of the course blocks the student does not reach the minimum qualification, the remedial exam will consist of an examination of the corresponding blocks in the extraordinary call. No mark will be saved for successive courses. Given the current uncertain health situation, in case that the competent health and educational authorities do not allow a face-to-face evaluation, a distance evaluation modality will be adopted using telematic means.				
<b>Observations for part-time students</b>				
Part-time students will jointly take the assessment tests with the other students.				

**8. BIBLIOGRAPHY AND TEACHING MATERIALS**

## BASIC

W.Smith,J.Hashemi. Fundamentos de la ciencia e ingeniería de materiales. McGraw-Hill Interamericana

C. Hoppe Atienza □ A. M. De Juan de Luna. Esfuerzos Axiles Teoría y problema. U.C.

C. Hoppe Atienza □ A. M. De Juan de Luna. Torsión Teoría y problemas. U.C.

Timoshenko. Resistencia de Materiales. Thomson España

W.D.Callister - Introducción a la ciencia e ingeniería de materiales . Limusa Wiley .

J.F. Shackelford - Introducción a la ciencia de materiales para ingenieros . Pearson Education.

D.Askeland,P.Phulé . Ciencia e ingeniería de materiales. CENGAGE learning.