

## SUBJECT TEACHING GUIDE

G593 - Resistance of Materials

Degree in Energy Resources Engineering

Academic year 2021-2022

1. IDENTIFYING DATA					
Degree	Degree in Energy Resources Engineering			Type and Year	Compulsory. Year 2
Faculty					
Discipline	Subject Area: Mining Pre-Technology Module: Training in Common with the Mining Branch				
Course unit title and code	G593 - Resistance of Materials				
Number of ECTS credits allocated	6	Term	Semester based (2)		
Web					
Language of instruction	Spanish	English Friendly	Yes	Mode of delivery	Face-to-face

Department	DPTO. TRANSPORTES Y TECNOLOGIA DE PROYECTOS Y PROCESOS				
Name of lecturer	JOKIN RICO ARENAL				
E-mail	jokin.rico@unican.es				
Office	E.P. de Ingeniería de Minas y Energía. Planta: + 2. DESPACHO (241)				
Other lecturers	NOEMI BARRAL RAMON				

### 3.1 LEARNING OUTCOMES

- Once the course has been passed, students will have obtained  
Acquisition of knowledge main in field of structural calculation  
Develop the ability to analyze, distinguish and solve a particular technical problem related to the discipline, simple and logical way by applying fundamental principles and tenets of the conforming own theories of Strength of Materials.

#### 4. OBJECTIVES

The objectives of the subject is focuses

Acquisition of knowledge main in field of estructural calculation

Develop the ability to analyze, distinguish and solve a particular technical problem related to the discipline, simple and logical way by applying fundamental principles and tenets of the conforming own theories of Strength of Materials.

## 6. COURSE ORGANIZATION

### CONTENTS

1	<p>Main objectives and hypothesis applied in material resistance</p> <p>Objectives of the material resistance</p> <p>Main hypothesis</p> <p>Main concepts. Stress, beam, unions, isostatism and hiperestatism.</p> <p>Main types of cargo</p> <p>Elements to reduce acting Forces.</p> <p>Bending moment</p> <p>Axil force</p> <p>Shear strength</p> <p>Properties of materials.</p> <p>Body elastic</p> <p>Hooke Law</p> <p>Stress-strain curves</p>
2	<p>EFFORTS (axial, shear) AND MOMENTS (BENDING, TORQUE)</p> <ul style="list-style-type: none"> <li>• Traction and simple compression.</li> </ul> <p>Prismatic bar subjected to a constant normal stress.</p> <p>Narvier hypothesis.</p> <p>Maximum admissible stress.</p> <p>Lateral contraction. Poisson's ratio.</p> <p>Traction-Compression in two or three orthogonal directions.</p> <ul style="list-style-type: none"> <li>• Flexion.</li> </ul> <p>Bending Pure, Simple bending, bending flat.</p> <p>Modulus (resistor module).</p> <p>Geometric performance.</p> <p>Influence of the shape of the cross section.</p> <p>Biaxial bending. Deformation.</p> <p>Composed bending.</p> <p>Influence of the section.</p> <ul style="list-style-type: none"> <li>• Shear strength.</li> </ul> <p>Influence of sections</p> <ul style="list-style-type: none"> <li>• torsional moment. Concept.</li> </ul> <p>Definition of torque.</p> <p>Effects of torque.</p> <p>Shear stresses caused by torsion.</p> <p>Torsion in hollow circular cylinders.</p> <ul style="list-style-type: none"> <li>• Shear strength.</li> </ul> <p>Influence of sections</p> <ul style="list-style-type: none"> <li>• torsional moment. Concept.</li> </ul> <p>Definition of torque.</p> <p>Effects of torque.</p> <p>Shear stresses caused by torsion.</p> <p>Torsion in hollow circular cylinders.</p>

3	<p>Deformations.</p> <ul style="list-style-type: none"> <li>• deformations in beams subjected to bending.</li> <li>• Differential equation of the elastic line.</li> <li>• Calculation of elastic line for double integration.</li> <li>• Method moment diagram area.</li> <li>• Mohr diagrams.</li> <li>• Job strain.</li> <li>• Application to hyperstatic beams.</li> </ul>
4	<p>APPLICATION TO COMPLEX grid. Supports and columns. Porches. Static plot.</p>
5	<p>1. EFFORTS (axial, shear) AND MOMENTS (BENDING, TORQUE) 2. Deformations 3. APPLICATION TO COMPLEX grid.</p>

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Written exam	Written exam	Yes	Yes	60,00
Test/ exam	Written exam	No	Yes	20,00
work	Work	No	Yes	20,00
TOTAL				100,00
Observations				
The final exam will be divided into the two main parts belonging theory and exercises. It is necessary to pass both individual parts in order to get through the whole subject.				
Observations for part-time students				
Part-time students will be evaluated according to the Regulations of the University of Cantabria. To this end, is them will enable the realization of the partial the same day of the final exam.				

#### 8. BIBLIOGRAPHY AND TEACHING MATERIALS

##### BASIC

"Resistencia de materiales". Stephen Timoshenko. 1982.  
 "Resistencia de materiales". William A. Nash. 1991.  
 "Estática gráfica". Otto Henkel. Por Joaquín Gay y Kurt Fizia. 1959.  
 "E.A.E. Instrucción del acero estructural". Gobierno de España. Ministerio de Fomento. 2012. Recurso electrónico:  
<http://www.fomento.gob.es/NR/rdonlyres/029BEBAG-A895-40E4-BA9F-FD0D75E3B865/107241/5EHE2008ultimo.pdf>  
 Apuntes proporcionados por los profesores. Disponibles en el OpenCourseWare para descarga en:  
<http://ocw.unican.es/enseanzas-tecnicas/resistencia-de-materiales>