

## SUBJECT TEACHING GUIDE

### 592 - Continuum Mechanics

#### Master's Degree in civil Engineering, Canal and Port Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Master's Degree in civil Engineering, Canal and Port Engineering			Type and Year	Compulsory. Year 1
Faculty	School of civil Engineering				
Discipline	EXTENSION OF CONTINUOUS MEANS MECHANICS				
Course unit title and code	592 - Continuum Mechanics				
Number of ECTS credits allocated	4,5	Term	Semester based (1)		
Web	<a href="https://ladicim.es/">https://ladicim.es/</a>				
Language of instruction	English	English Friendly	No	Mode of delivery	Face-to-face

Department	DPTO. CIENCIA E INGENIERIA DEL TERRENO Y DE LOS MATERIALES				
Name of lecturer	DIEGO FERREÑO BLANCO				
E-mail	diego.ferreno@unican.es				
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 0. DESPACHO (0004)				
Other lecturers	MARIA EMILIA MAZA FERNANDEZ				

3.1 LEARNING OUTCOMES
- To handle elementary notions of tensor calculus
- Handle the description of movement, deformations and stresses.
- To apply predictively the general laws of thermomechanics of continuum media in mechanics of solids and materials
- Apply predictively the general laws of thermomechanics of continuum media in fluid mechanics.
- To apply the balance and conservation laws to solids and fluids.
- To develop and understand models of material behaviour to solids and fluids.

#### 4. OBJECTIVES

The main objectives of the course are the understanding and mastery of the basic fundamentals of nonlinear Continuum Mechanics and its application to solid and fluid mechanics. Specifically, we will analyze the description of the deformation in a continuous medium as well as the stress state. Next, we will examine the restrictions imposed by the physical conservation laws (linear momentum, angular momentum and energy). Finally, we will apply these concepts to different constitutive equations: Elasticity, Plasticity and Fluid Mechanics.

#### 6. SUBJECT PROGRAM

CONTENTS	
1	Introduction: What is this course about?
2	Kinematics: Spatial and Referential (or Eulerian and Lagrangian) forms.
3	Strain: How to measure the deformation of a continuous body.
4	Compatibility Equations: Not every strain field is physically meaningful.
5	Stress: The approach given by Cauchy a long time ago.
6	Conservation - Balance: The basic conservation principles expressed in the language of continuum mechanics. Heat, Work, Entropy and all this stuff.
7	Fluids: Constitutive equations and applications.

#### 7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Multichoice test	Work	No	Yes	2,00
Multichoice test	Work	No	Yes	5,00
Multichoice test	Work	No	Yes	2,00
Multichoice test	Work	No	Yes	4,00
Multichoice test	Work	No	Yes	7,00
Multichoice test	Work	No	Yes	10,00
Proofs and exercises	Written exam	No	Yes	30,00
Proofs and exercises	Written exam	No	Yes	30,00
Presentation about a topic proposed by the professors	Work	No	No	10,00
<b>TOTAL</b>				<b>100,00</b>
<b>Observations</b>				
<p>The assessment of the course is based on four items (with the following weights):</p> <ul style="list-style-type: none"> <li>- MIDTERM EXAM (LESSONS 1-4): 30%</li> <li>- FINAL EXAM (LESSONS 5-6): 30%</li> <li>- CONTINUOUS EVALUATION: 30%</li> <li>- FINAL WORK PRESENTATION (LESSONS 7-8): 10%</li> </ul> <p>Both for the midterm and for the final, a minimum grade of 3.0/10 is required as a condition to pass the subject.</p>				
<b>Observations for part-time students</b>				
<p>Part-time students will be offered two alternatives, so they can choose the one that suits them best:</p> <ol style="list-style-type: none"> <li>1) Attend the continuous assessment despite not having attended the regular classes.</li> <li>2) Take a single final exam once teaching is finished.</li> </ol>				

**8. BIBLIOGRAPHY AND TEACHING MATERIALS**

**BASIC**

We will follow the book by Oliver and Agelet de Saracibar: CONTINUUM MECHANICS FOR ENGINEERS. THEORY AND PROBLEMS. Second Edition.