

SUBJECT TEACHING GUIDE

G1974 - Elasticity and Plasticity

Degree in Civil Engineering First Degree in Civil Engineering

Academic year 2024-2025

1. IDENTIFYING DATA					
Degree	Degree in Civil Engineering First Degree in Civil Engineering			Type and Year	Compulsory. Year 3 Compulsory. Year 3
Faculty	School of civil Engineering				
Discipline	FUNDAMENTALS OF CONTINUUM MECHANICS				
Course unit title and code	G1974 - Elasticity and Plasticity				
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	JOSE RAMON IBAÑEZ DEL RIO				
E-mail	jose.ibanez@unican.es				
Office	E.T.S. de Ingenieros de Caminos, Canales y Puertos. Planta: + 2. DESPACHO (2063)				
Other lecturers	CLAUDIO LOPEZ CASTILLO				

3.1 LEARNING OUTCOMES
- Understand the equations of elasticity and apply them to the mechanics of deformable solids, structures, and soil mechanics.
- Solve problems related to the stress-strain state at a point of an elastic solid.
- Apply software to the study of stresses and strains in linear elasticity theory.
- Understand the plastification and failure criteria for ductile and fragile materials, as well as plasticity theories and their application to the mechanics of deformable solids, structures and soil mechanics
- Resolve the stress-strain state of a section in the elasto-plastic range, and apply it to the resolution of simple structures.

4. OBJECTIVES

The student will master the concepts of tension and deformation for its application to the resolution of continuum mechanics problems, as well as the resolution of linear elasticity problems, plastification criteria and plastic calculation of structures.

6. SUBJECT PROGRAM

CONTENTS

1	Approach to Continuum Mechanics: 1.1.- Stress analysis. 1.2 Strain analysis.
2	Application to the theory of Elasticity. 2.1- The general elastic problem. 2.2- Two-dimensional elasticity in Cartesian coordinates. 2.3- Two-dimensional elasticity in polar coordinates (soil mechanics). 2.4- Applications of elasticity to torsion (Prandtl's theory)
3	Application to plasticity: 3.1.-The phenomenon of plastification: Criteria for creep and breakage of all types of materials and soils. 3.2.- Plastic analysis of prismatic pieces. elastoplastic bending. Plastic stress redistribution. Plastic calculation of structures.

7. ASSESSMENT METHODS AND CRITERIA

Description	Type	Final Eval.	Reassessn	%
Classroom exercises (10%)	Others	No	No	10,00
First partial exam (35%)	Written exam	No	Yes	35,00
Second partial exam (35%)	Written exam	No	Yes	35,00
Chapter exercises (20%)	Others	No	No	20,00
TOTAL				100,00

Observations

In order to be able to pass the partial exams, the student must submit the exercises proposed by the professor and the laboratory practices on time. Those students who do not fulfill this requirement and are not part-time students will opt to pass in the recovery exams (January and February extraordinary exams).

Students who do not complete the computer applications practices will be considered failed in the second partial and therefore must take the make-up exams (January and February).

The total grade of the course will be obtained taking into account the two mid-term exams, the class practicals and the subject exercises as long as the minimum grade in the mid-term exams is met.

In the final recovery exam (January or February) the student will be released from the subjects passed in the midterm exams. The student who passed the two midterm exams and who has presented the computer practices will not have to take the final exams of recovery as long as his average grade is equal or higher than 5.0.

For those students with the right to take the exam in November, the exam will be for the whole course and in order to pass the exam they will have to obtain an average grade of 5.0 or higher.

Only for duly justified reasons (e.g. health restrictions) the evaluation tests may be organized remotely, with the previous authorization of the Center's Direction.

Observations for part-time students

Students enrolled part-time are not required to do classroom exercises or subject exercises, but must submit a computer application work proposed by the teacher. They will only have to pass by midterm (in this case each midterm is a 50% of the grade) or recover them in the official calls of January and extraordinary of February fixed by the Center .

8. BIBLIOGRAPHY AND TEACHING MATERIALS

BASIC

Mecanica de los Medios Continuos I (Teoria) J.Diaz del Valle. Servicio de Publicaciones ETS de Ingenieros de Caminos de Santander

Mecanica de los Medios Continuos II (Problemas) J.Diaz del Valle. Servicio de publicaciones ETS de Ingenieros de Caminos de Santander

Teoria de la Elasticidad. Timoshenko. Editorial Urmo

Calculo Plastico de Estructuras. Carlos Benito. Escuela de Ingenieros de Caminos. Madrid