

**1. General information****Course:** MECHANICS OF DEFORMABLE SOLIDS**Type:** CORE COURSE**Degree:** 419 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING**Center:** 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING**Year:** 3**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56315**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 56**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** XIAOXIN ZHANG --- - Group(s): 56

Building/Office	Department	Phone number	Email	Office hours
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2. Pre-Requisites

To have a general knowledge on the mathematics, mechanics and graphic expression.

3. Justification in the curriculum, relation to other subjects and to the profession

The Resolución of 15 January of 2009, BOE of 29 January (Orden CIN / 351/2009, 9 February, BOE of 20 February 2009) establishes the requirements that the new degree titles must meet in order to be able to exercise the profession of Technical Industrial Engineer.

It is a common subject of the specialty of Mechanical Engineering in which students are initiated in the study of elastic solids. In the previous semester the subject of "Mechanics of Materials (Resistencia de Materiales)" is taught, where the analysis of stresses and deformations of structural components subjected to the constant loads are studied, while in the current subject the theory of the elasticity and its applications to any type of solid are presented, such as non-elastic behaviour.

4. Degree competences achieved in this course**Course competences**

Code	Description
CB01	Prove that they have acquired and understood knowledge in a subject area that derives from general secondary education and is appropriate to a level based on advanced course books, and includes updated and cutting-edge aspects of their field of knowledge.
CB02	Apply their knowledge to their job or vocation in a professional manner and show that they have the competences to construct and justify arguments and solve problems within their subject area.
CB03	Be able to gather and process relevant information (usually within their subject area) to give opinions, including reflections on relevant social, scientific or ethical issues.
CB04	Transmit information, ideas, problems and solutions for both specialist and non-specialist audiences.
CB05	Have developed the necessary learning abilities to carry on studying autonomously
CEM04	Knowledge and capacities to apply the fundamentals of elasticity and resistance of materials to the behaviour of real solids.
CG03	Knowledge of basic and technological subjects to facilitate learning of new methods and theories, and provide versatility to adapt to new situations.
CG04	Ability to solve problems with initiative, decision-making, creativity, critical reasoning and to communicate and transmit knowledge, skills and abilities in the field of industrial engineering.
CG06	Ability to handle specifications, regulations and mandatory standards.
CT01	Knowledge of a second language.
CT02	Knowledge and application of information and communication technology.
CT03	Ability to communicate correctly in both spoken and written form.

5. Objectives or Learning Outcomes**Course learning outcomes****Description**

Knowledge of the basic equations governing the behaviour of deformable solids in three dimensions.

Basic knowledge of elasticity and strength of materials to real solids.

Knowledge of the non-elastic behaviour of solids.

6. Units / Contents**Unit 1: Introduction of tensor****Unit 2: Stress tensor****Unit 3: Strain tensor****Unit 4: Relation between the stress and strain**

Unit 5: Approach to the elastic problem**Unit 6: Introduction of the plastic theory****ADDITIONAL COMMENTS, REMARKS**

Description of the Contents:

Elastic behavior of three-dimensional solids. Application of the theory of elasticity and resistance of materials to real solids. Introduction to non-elastic behaviors. Laboratory/computer practices.

In the event of establishing the online teaching modality due to force majeure, online teaching will be given through the TEAMS and MOODLE tools, maintaining the same agenda.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	Description
Class Attendance (theory) [ON-SITE]	Lectures	CB01 CB02 CB03 CB04 CB05 CEM04 CG03 CG04 CG06 CT01 CT02 CT03	1.36	34	N		The teacher will focus on the topic and the fundamental contents of the subject, using a blackboard, audiovisual media and academic experiences.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB01 CB02 CB03 CB04 CB05 CEM04 CG03 CG04 CG06 CT01 CT02 CT03	0.6	15	Y	N	Resolution of individual or small group laboratory practices with computers.
Formative Assessment [ON-SITE]	Assessment tests	CB01 CB02 CB03 CB04 CB05 CEM04 CG03 CG04 CG06 CT01 CT02 CT03	0.16	4	Y	Y	They will consist of two tests related to aspects of the theoretical-practical application.
Study and Exam Preparation [OFF-SITE]	Self-study	CB01 CB02 CB03 CB04 CB05 CEM04 CG03 CG04 CG06 CT01 CT02 CT03	3.6	90	N		Personal study of theory and problems.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB01 CB02 CB03 CB04 CB05 CEM04 CG03 CG04 CG06 CT01 CT02 CT03	0.28	7	Y	Y	Each student will carry out exercises and practical problems related to the corresponding topic.
Total:			6	150			
Total credits of in-class work: 2.4			Total class time hours: 60				
Total credits of out of class work: 3.6			Total hours of out of class work: 90				

As: Assessable training activity

Com: Training activity of compulsory overcoming (It will be essential to overcome both continuous and non-continuous assessment).

8. Evaluation criteria and Grading System

Evaluation System	Continuous assessment	Non-continuous evaluation*	Description
Assessment of problem solving and/or case studies	15.00%	15.00%	The reports of seminars, problems and / or papers presented as well as the attitude shown by the student will be evaluated. The content is on the principal stresses and directions.
Mid-term tests	70.00%	0.00%	Two tests related with the application of theoretical-practical aspects. Each test must be passed at least 4 out of 10.
Final test	0.00%	70.00%	It will consist of a test that encompasses all the topics of the subject (final exam).
Laboratory sessions	15.00%	15.00%	Use a software (Mathematica or Matlab, etc.) to check the analytical results of the problems. The results obtained and the cleanliness and presentation of the document will be taken into account.
Total:	100.00%	100.00%	

According to art. 4 of the UCLM Student Evaluation Regulations, it must be provided to students who cannot regularly attend face-to-face training activities the passing of the subject, having the right (art. 12.2) to be globally graded, in 2 annual calls per subject, an ordinary and an extraordinary one (evaluating 100% of the competences).

Evaluation criteria for the final exam:**Continuous assessment:**

The subject will be passed with a score equal to or greater than 5.

Those students who have not passed any of the partial exams, will maintain the score of the exams passed for the final ordinary and extraordinary exams, having to be examined only for the partial tests not passed.

Non-continuous evaluation:

FINAL SCORE = 0.15 x (GRADE IN ASSESSMENT OF PROBLEM SOLVING AND/OR CASE STUDIES) + 0.15 x (GRADE IN LABORATORY SESSIONS) + 0.7 x (GRADE IN FINAL TEST).

The subject will be passed with a score equal to or greater than 5.

Specifications for the resit/retake exam:

The subject will be passed with a score equal to or greater than 5.

Specifications for the second resit / retake exam:

The subject will be passed with a score equal to or greater than 5.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	34
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	7
Global activity	
Activities	hours
Class Attendance (theory) [PRESENCIAL][Lectures]	34
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	7
Total horas: 150	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Ansel C. Ugural, Saul K. Fenster	Advanced mechanics of materials and applied elasticity (6th edition)	Pearson		978-0134859286	2019	
López Cela, Juan José	Mecánica de los medios continuos	Ediciones de la Universidad de Castilla-La Manc		84-8427-030-0	1999	
Oliver, J. (Javier Oliver Olivella)	Mecánica de medios continuos para ingenieros	Edicions UPC		84-8301-582-X	2002	
Ortiz Berrocal, Luis	Elasticidad	McGraw-Hill		84-481-2046-9	2004	
Spencer, A.J.M.	Continuum mechanics	Dover		0-486-43594-6	1980	