UNIVERSIDAD DE CASTILLA - LA MANCHA

GUÍA DOCENTE

1. General information

Course: MECHANICS OF DEFORMABLE SOLIDS
Code: 56315
Type: CORE COURSE
ECTS credits: 6
Degree: 351 - UNDERGRADUATE DEGREE PROG. IN MECHANICAL ENGINEERING
Academic year: 2019-20
Center: 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING
Group(s): 56
Year: 2
Duration: C2
Main language: Spanish
Second language: English
Use of additional languages:
English Friendly: Y
Web site:
Bilingual: N

Lecturer: **XIAOXIN ZHANG ---** - Group(s): **56**

Building/Office	Department	Phone number	Email	Office hours
Politécnico/2-A54	MECÁNICA ADA. E ING. PROYECTOS	926052870	Xiaoxin.Zhang@uclm.es	

2. Pre-Requisites

To have a general knowledge on 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 must meet the new degree titles so that habilitate in the exercise of the profession of Technical Industrial Engineer.

This is a common subject of the Mechanical specialty in which students are initiated in the study of elastic solids. In the previous semester the subject of "Materials resistance" is studied, where the analysis of stresses and deformations of structural components subjected to fixed loads in time are studied, while in the current subject the theory of the elasticity and its applications to any type of solid are presented.

4. Degree competences achieved in this course

Course competences

Code	Description
A01	To understand and have knowledge in an area of study that moves on from the general education attained at secondary level and usually found at a level that, while supported in advanced text books, also includes some aspects that include knowledge found at the cutting edge of the field of study.
A02	To know how to apply knowledge to work or vocation in a professional manner and possess the competences that are usually demonstrated by the formulation and defence of arguments and the resolution of problems in the field of study.
A04	To be able to transmit information, ideas, problems and solutions to a specialized audience.
A07	Knowledge of Information Technology and Communication (ITC).
A08	Appropriate level of oral and written communication.
A09	Ethical and professional commitment.
A12	Knowledge of basic materials and technologies that assist the learning of new methods and theories and enable versatility to adapt to new situations.
A13	Ability to take the initiative to solve problems, take decisions, creativity, critical reasoning and ability to communicate and transmit knowledge, skills and abilities in Mechanical Engineering.
C08	Knowledge and use of the principles of the resistance of materials.
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
D04	Knowledge and ability to apply the fundamentals of elasticity and resistance of materials to the behaviour of real solids.

5. Objectives or Learning Outcomes

Course learning outcomes

Description
Calculate the distribution of tensions in a section
Apply basic knowledge of elasticity and resistance of materials to real solids
Measure simple structural elements
Initiation in learning of the non-elastic behaviour of solids
Manual techniques for calculating displacement and strengths in structural elements

To know when a solid can be studied through geometrical and material simplifications

6. Units / Contents

Unit 1: Elastic behavior of three-dimensional solids.

Unit 1.1 Introduction to the study of elasticity: Hypothesis and fundamental principles.

Unit 1.2 Stresses: Concept of stress, equations of equilibrium , stresses and principal directions.

Unit 1.3 Strains: Strains around of a point, strain state, strain vector, strains and principal directions and compatibility equations.

Unit 1.4 Relationships between stresses and strains: tensile test, generalized Hook laws and Lamé equations.

Unit 2: Theory of elasticity application and resistance of materials to real solids.

Unit 2.1 Approach to the elastic problem: Internal and external balance, formulations of the fundamental equations of elasticity and general methods of resolution.

Unit 2.2 Two-dimensional elasticity: Flat linear elasticity, tension and flat deformation and resolution methods.

Unit 3: Introduction to non-elastic behaviors.

Unit 3.1 Introduction to plastic theory: Plasticization criteria: von Mises criterion, Tresca criterion, Mohr-Coulomb criterion and Drucker-Prager criterion.

7. Activities, Units/Modules and Methodology

Training Activity	Methodology	Related Competences (only degrees before RD 822/2021)	ECTS	Hours	As	Com	R	Description
Class Attendance (theory) [ON-SITE]	Lectures	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	0.8	20	N	-	-	
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	0.4	10	N	-	-	
Laboratory practice or sessions [ON-SITE]	Practical or hands-on activities	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	0.48	12	Y	N	N	
Workshops or seminars [ON-SITE]	Workshops and Seminars	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	0.4	10	Y	N	N	
Individual tutoring sessions [ON-SITE]	Other Methodologies	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	0.16	4	N	-	-	
Final test [ON-SITE]	Assessment tests	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	0.16	4	Y	Y	Y	
Study and Exam Preparation [OFF-SITE]	Self-study	A01 A02 A04 A07 A08 A09 A12 A13 C08 CB01 CB02 CB03 CB04 CB05 D04	3.6	90	N	-	-	
		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
R: Rescheduling training activity

8. Evaluation criteria and Grading System

	Grading System		
Evaluation System	**Face-to-Face**	**Self-Study Student**	**Description**
Theoretical papers assessment	30.00%	0.00%	The reports of seminars, problems and / or papers presented as well as the attitude shown by the student will be evaluated.
Final test	70.00%	0.00%	Two tests related with the application of theoretical-practical aspects. Each test must be passed at least 5 out of 10.
Total:	**100.00%**	**0.00%**	

Evaluation criteria for the final exam:

The subject will be passed with a score equal to or greater than 5.
For those students who have not passed some of the recoverable tests a global test will be set.

Specifications for the resit/retake exam:

The subject will be passed with a score equal to or greater than 5.
For those students who have not passed some of the recoverable tests a global test will be set.

9. Assignments, course calendar and important dates

Not related to the syllabus/contents

Hours	hours
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	12
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	4
Final test [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	30

Unit 1 (de 3): Elastic behavior of three-dimensional solids.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	12
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	6
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	6
Study and Exam Preparation [AUTÓNOMA][Self-study]	36
Unit 2 (de 3): Theory of elasticity application and resistance of materials to real solids.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	5
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	3
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	3
Study and Exam Preparation [AUTÓNOMA][Self-study]	16.5
Unit 3 (de 3): Introduction to non-elastic behaviors.	
Activities	**Hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	3
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	1
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	1
Study and Exam Preparation [AUTÓNOMA][Self-study]	7.5
Global activity	
Activities	**hours**
Class Attendance (theory) [PRESENCIAL][Lectures]	20
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	10
Laboratory practice or sessions [PRESENCIAL][Practical or hands-on activities]	12
Workshops or seminars [PRESENCIAL][Workshops and Seminars]	10
Individual tutoring sessions [PRESENCIAL][Other Methodologies]	4
Final test [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Total horas:	150

10. Bibliography and Sources

Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
López Cela, Juan José	Mecánica de los medios continuos	Ediciones de la Universidad de Castilla-La Manc		84-8427-030-0	1999	
MASE, George E.	Teoría y problemas de mecánica del medio continuo	McGraw-Hill		0-07-091668-3	1977	
Madhukar Vable	Mechanics of Materials					Michigan Technological University
	http://madhuvable.org/wp-content/uploads/2016/04/Intro-2nd-Edition.pdf					
Mase, George E.	Theory and problems of continuum mechanics	McGraw-Hill		0-07-040663-4	1970	
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.	Continuun mechanics	Dover		0-486-43594-6	1980	