

**1. General information****Course:** STRENGTH OF MATERIALS**Type:** CORE COURSE**Degree:** 412 - UNDERGRADUATE DEGREE PROGRAMME IN ELECTRICAL ENGINEERING**Center:** 106 - SCHOOL OF MINING AND INDUSTRIAL ENGINEERING**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:****Code:** 56310**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 55**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** XIAOXIN ZHANG --- - Group(s): 55

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**2. Pre-Requisites**

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.

It is a common subject of the specialty of Mechanical Engineering in which students are initiated in the study of elastic solids. The knowledge in resistance of materials is provided so that the student obtains the foundations and applications in the analysis of stresses and strains of structural components subjected to constant fixed loads over time. The training in the following course will be completed with the subject "Mechanics of deformable solids".

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

Code	Description
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
CEC08	Knowledge and use of the principles of the resistance of materials.
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.
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**

El estudiante aprenderá a dimensionar elementos estructurales simples.

Ability to calculate the stress distribution in a cross-section.

Knowledge of when a real solid can be studied by means of two simplifications, geometric and material

Acquisition of manual techniques for calculating displacements and forces in structural elements.

Study of one-dimensional solids (bars and beams) made of a material that behaves in the elastic range.

**6. Units / Contents**

**Unit 1:** Calculation of structures formed by one-dimensional elements. Structures of articulated nodes and rigid nodes.

**Unit 2:** Calculation of reactions and forces in isostatic systems.

**Unit 3:** Methods for obtaining turns and displacements. Elasticity of the beam and deformations.

**Unit 4:** Calculation of reactions and forces in hyperstatic systems.

**Unit 5:** Normal and tangential stresses in bending. Combination of forces.

**Unit 6:** Torsion

**Unit 7:** Buckling, theory of Euler

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]	Combination of methods	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 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.
Problem solving and/or case studies [ON-SITE]	Combination of methods	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	0.28	7	N		The teacher will carry out exercises and practical problems related to the corresponding topic.
Formative Assessment [ON-SITE]	Assessment tests	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	0.16	4	Y	Y	They will consist of two tests related to aspects of the theoretical-practical application.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	0.6	15	Y	Y	Resolution of individual or small group laboratory practices with computers.
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	3.6	90	N		Study and preparation of exams by the student autonomously.
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
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).
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.
Assessment of activities done in the computer labs	15.00%	15.00%	Use software (MDSolids) to check the analytical results of the problems. The results obtained and the cleaning and presentation of the document will be taken into account. The content is on flexure.
<b>Total:</b>	<b>100.00%</b>	<b>100.00%</b>	

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:

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
<b>Unit 1 (de 7): Calculation of structures formed by one-dimensional elements. Structures of articulated nodes and rigid nodes.</b>	
<b>Activities</b>	<b>Hours</b>
Class Attendance (theory) [PRESENCIAL][Combination of methods]	34
Problem solving and/or case studies [PRESENCIAL][Combination of methods]	7
Formative Assessment [PRESENCIAL][Assessment tests]	4
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
<b>Global activity</b>	
<b>Activities</b>	<b>hours</b>
Class Attendance (theory) [PRESENCIAL][Combination of methods]	34

Problem solving and/or case studies [PRESENCIAL][Combination of methods]	7
Formative Assessment [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
<b>Total horas: 150</b>	

10. Bibliography and Sources						
Author(s)	Title/Link	Publishing house	Citv	ISBN	Year	Description
Russell Charles Hibbeler	Mechanics of materials	Pearson		9780134319650	2015	
Vázquez Fernández, Manuel	Resistencia de materiales	Noela		84-88012-05-5	1999	
Beer, Ferdinand P.	Mecánica de materiales	McGraw-Hill Interamericana		970-10-6101-2	2007	
Beer, Ferdinand P.	Mecánica vectorial para ingenieros : Estática	McGraw-Hill Interamericana		978-607-15-0277-3	2010	
Ortiz Berrocal, Luis	Resistencia de materiales	McGraw-Hill		978-84-481-5633-6	2007	
Rodríguez-Avial Azcunaga, Fernando	Resistencia de materiales	Librería Bellisco		84-85198-58-1 (T. II)	1990	
Timoshenko, S.P., Gere, J.M.	Resistencia de Materiales	Thomson		8497320654	2002	