

**1. General information****Course:** STRENGTH OF MATERIALS**Type:** CORE COURSE**Degree:** 418 - UNDERGRAD. IN INDUSTRIAL ELECTRONICS AND AUTOMAT. ENGINEERING**Center:** 303 - E.DE INGENIERÍA INDUSTRIAL Y AEROSPOACIAL DE TOLEDO**Year:** 2**Main language:** Spanish**Use of additional languages:****Web site:** <https://campusvirtual.uclm.es/>**Code:** 56310**ECTS credits:** 6**Academic year:** 2023-24**Group(s):** 41**Duration:** First semester**Second language:** English**English Friendly:** Y**Bilingual:** N**Lecturer:** SERGIO HORTA MUÑOZ - Group(s): 41

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Sabatini / Despacho 1.05	MECÁNICA ADA. E ING. PROYECTOS	926052830	Sergio.Horta@uclm.es	In person: timetable will be published at the beginning of the semester. Online: permanently on the Virtual Campus (Moodle Platform), Teams and at the email address Sergio.Horta@uclm.es. The tutorial schedule will be published at the address: https://www.uclm.es/toledo/eiia/informacion_academica/

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2. Pre-Requisites

The student must have acquired the knowledge taught in the subjects of mathematics and physics.

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

This subject provides the student with the skills to carry out the professional activity of Industrial Technical Engineer related to the fundamental concepts of structural calculation.

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**

Ability to dimension simple structural elements

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 materia

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 joint nodes and rigid nodes.

Unit 2: Calculation of reactions and internal forces in statically determinate (isostatic) structures.

Unit 3: Methods for computing rotations and displacements. Strains and Euler-Bernoulli Beam equation.

Unit 4: Calculation of reactions and internal forces in statically indeterminate structures.

Unit 5: Normal and shear stresses in bending. Combination of internal forces.

Unit 6: Torsion.

Unit 7: Buckling. Euler's theory.

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	1.36	34	N		Development of theoretical contents in classroom, using the participatory lecture method. Group tutorials, - direct teacher-student interaction. Resolution of exercises and problems in the classroom in a participatory way.
Problem solving and/or case studies [ON-SITE]	Problem solving and exercises	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	0.28	7	N		Resolution of exercises and - problems in the classroom in a participatory way.
Class Attendance (practical) [ON-SITE]	Practical or hands-on activities	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	0.6	15	Y	N	Laboratory practices and/or in the computer room, with the use of specific software for calculating structures.
Formative Assessment [ON-SITE]	Assessment tests	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT03	0.16	4	Y	Y	Follow-up and final tests
Study and Exam Preparation [OFF-SITE]	Self-study	CB02 CB03 CB04 CB05 CEC08 CG03 CG04 CT02 CT03	3.6	90	N		Personal study of theory and - problems. Resolution and delivery of theoretical-practical work in groups.
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
Laboratory sessions	15.00%	15.00%	C: Test to monitor the student's learning. Recoverable. NC: exam related to the practical sessions, taken on the day of the final exam.
Projects	15.00%	15.00%	C: Theoretical-practical exercises to be solved in groups. Recoverable. NC: Delivery of the theoretical-practical exercises on the day of the final exam.
Final test	70.00%	70.00%	C: final test that will consist of theoretical questions and/or problems. Recoverable. NC: final test that will consist of theoretical questions and/or problems. The minimum grade for this part to be compensable will be 4 points (out of 10)
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:

Final exam (E): Test that will consist of theoretical questions and/or problems. To pass the subject it will be necessary to obtain a minimum grade of 4 in the final test (70%)

Work (P): Theoretical-practical exercises to be solved individually and/or in a group (15%)

Laboratory practices (L): Test that will consist of theoretical questions and/or problems. It will be held on a date associated with laboratory practices (15%)

It will be considered that the student has passed the subject if, being $E \geq 4$ and calculating the final grade as $\text{Final Grade} = E \cdot 0.7 + P \cdot 0.15 + L \cdot 0.15$, the

Final Grade is greater than or equal to 5. In case of that $E < 4$, the final grade cannot be higher than 4.

Non-continuous evaluation:

A Single Test (ST) will be carried out that will consist of theoretical questions and/or problems that will include the competencies evaluated in the Final Exam and in the Laboratory Practices (70% + 15%).

To assess the competencies evaluated in the Project (15%), either the student will be asked to submit assignments or an additional test with theoretical-practical questions and/or exercises to be solved in computer room.

The Final Grade of the subject will be obtained as $NF=0.85*ST+0.15*P$, being necessary a Final Grade greater than or equal to 5 to pass the subject.

Specifications for the resit/retake exam:

A Single Test (ST) will be carried out that will consist of theoretical questions and/or problems that will include the competencies evaluated in the Final Exam and in the Laboratory Practices (70% + 15%).

To assess the skills evaluated in the Project(15%): The student who requests it will keep the grade obtained in the Work of the ordinary call. The student who chooses not to keep the grade obtained in the Work in the ordinary call, will either be asked to submit work or an additional test with theoretical-practical questions and/or exercises will be carried out on the same day of the Single Test. Solve in the computer room.

The Final Grade of the subject will be obtained as $NF=0.85*ST+0.15*P$, being necessary a Final Grade greater than or equal to 5 to pass the subject.

Specifications for the second resit / retake exam:

A Single Test (ST) will be carried out that will consist of theoretical questions and/or problems that will include the competencies evaluated in the Final Exam and in the Laboratory Practices (70% + 15%).

To assess the competencies evaluated in the Project (15%): The student who requests it will keep the grade obtained in the Work of the ordinary call of the last academic year that he has completed. The student who chooses not to keep the grade obtained in the Work in the ordinary call, will either be asked to submit work or an additional test with theoretical-practical questions and/or exercises will be carried out on the same day of the Single Test. Solve in the computer room.

The Final Grade of the subject will be obtained as $NF=0.85*ST+0.15*P$, being necessary a Final Grade greater than or equal to 5 to pass the subject.

9. Assignments, course calendar and important dates	
Not related to the syllabus/contents	
Hours	hours
Class Attendance (theory) [PRESENCIAL][Combination of methods]	34
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	7
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	4
Study and Exam Preparation [AUTÓNOMA][Self-study]	90
Global activity	
Activities	hours
Problem solving and/or case studies [PRESENCIAL][Problem solving and exercises]	7
Class Attendance (practical) [PRESENCIAL][Practical or hands-on activities]	15
Formative Assessment [PRESENCIAL][Assessment tests]	4
Class Attendance (theory) [PRESENCIAL][Combination of methods]	34
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
Garrido García, José A.	Resistencia de materiales	Secretariado de Publicaciones e Intercambio Cie		84-7762-951-X	1999	
Den Hartog J.P.	STRENGTH OF MATERIALS	Dover			1961	
MacGuire, William	Matrix structural analysis	John Wiley & Sons		0-471-12918-6	2000	
Ortiz Berrocal, Luis	Resistencia de materiales	McGraw-Hill		84-7615-512-3	1999	
Timoshenko S.P., Gere J.M.	Resistencia de Materiales	Thomson			2002	
Timoshenko, Stephen (1878-1972)	Resistencia de materiales	Espasa-Calpe		84-239-6315-2 (t.1)	1980	
Vázquez Fernández, Manuel	Resistencia de materiales	Noela		84-88012-05-5	1999	