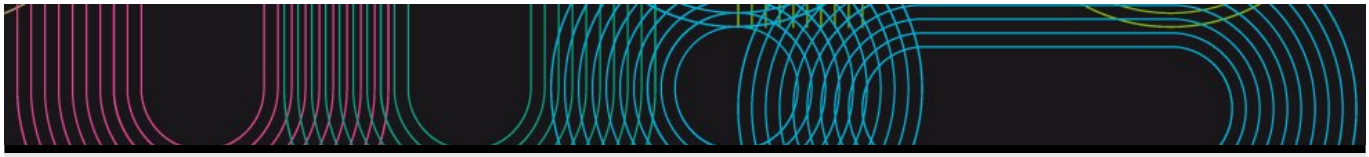

IDENTIFYING DATA				
Elasticity and additional topics in mechanics of materials				
Subject	Elasticity and additional topics in mechanics of materials			
Code	V12G360V01603			
Study programme	Grado en Ingeniería en Tecnologías Industriales			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Mandatory	3rd	2nd
Teaching language	Spanish			
Department				
Coordinator	Riveiro Rodríguez, Antonio			
Lecturers	García González, Marcos Lorenzo Mateo, Jaime Alberto Riveiro Rodríguez, Antonio			
E-mail	ariveiro@uvigo.es			
Web				
General description	This course will study the fundamentals of elasticity and deepen the study of mechanics of materials in order to be able to apply their knowledge to the actual behavior of solids (structures , machinery and resistant elements in general). This course, along with mechanics of materials course, is a holder of more specialized subjects whose object is the mechanical design.			

Training and Learning Results	
Code	
B3	CG3 Knowledge in basic and technological subjects that will enable them to learn new methods and theories, and equip them with versatility to adapt to new situations.
B4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and to communicate and transmit knowledge, skills and abilities in the field of Industrial Engineering.
C14	CE14 Knowledge and use of the principles of strength of materials.
D2	CT2 Problems resolution.
D5	CT5 Information Management.
D9	CT9 Apply knowledge.
D10	CT10 Self learning and work.
D17	CT17 Working as a team.

Expected results from this subject	Training and Learning Results		
Knowledge of the foundations of the elasticity theory	B3	C14	
Further deepening on mechanics of materials and stress analysis	B3 B4	C14	D2 D10
Knowledge of deformations in beams and shafts	B3 B4	C14	D2 D9
Ability to apply the knowledge of elasticity and mechanics of materials, and to analyze the mechanical performance of machines, structures, and general structural elements	B4	C14	D2 D5 D9
Ability to take decisions about suitable material, shape and dimensions for a structural element subjected to a specific load	B4	C14	D2 D5 D9 D17

Knowledge of different solving methods for structural problems and ability to choose the most suitable method for each specific problem	B4	C14	D2 D5 D9

Contents	
Topic	
Fundamentals of elasticity	Introduction to the theory of elasticity Stress analysis of elastic solids Strain Stress-strain relationships Two-dimensional elasticity
Criteria of failure	Saint-Venant's failure criterion Tresca's failure criterion Von-Mises' failure criterion Safety coefficient
Bending	Non uniform bending: Shear stresses. Zhuravski expression Principal stresses. Stress trajectories Bending and axial load: Normal stresses. Neutral axis Eccentric axial loads Kern of the cross-section Beams of different materials
Bending. Statically indeterminate beams	General method Settlements in fixed supports Continuous beams Simplifications in symmetric and antisymmetric beams
Torsion	Definition Coulomb's fundamental theory Static torque diagrams Stress and angle of twist Statically indeterminate problems
Combined loads	Definition Bending and torsion loaded circular shafts Shear center Stress and strain calculation in plane-spatial structures
Strain energy and energy methods	Strain energy: Axial load/shearing loads/bending/torsion/general expression. Clapeyron's theorem Indirect and direct work Maxwell-Betti Reciprocal Theorem. Applications. Castigliano's theorem. Mohr's integrals. Applications. Principle of virtual works.
Trusses	Definition and general comments Degree of indeterminacy Analytical method of force calculation Pinned joint displacement determination External indeterminacy and internal indeterminacy
Structures with rigid joint connections	Definition Joint stiffness factor and distribution factor Degree of indeterminacy. Analysis by the stiffness method.
Moving loads	Influence lines. Definition and general properties.

Planning			
	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Previous studies	0	6	6
Lecturing	13	26	39
Problem solving	18	22	40
Laboratory practical	18	7	25
Autonomous problem solving	0	15	15
Problem and/or exercise solving	2	17.5	19.5
Self-assessment	0	5	5
*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.			

Methodologies

	Description
Introductory activities	Introduction to the subject: Course aims, expected learning outcomes, course syllabus, teaching methods, assessments and grading policy.
Previous studies	Student previous activities to lectures. The students will receive detailed instructions to complete and send certain exercises before lectures/laboratory sessions. The purpose of this assessment is to optimize the session outcome. The delivery of these exercises will modify the obtained qualification of the continuous assessment (laboratory practices and conceptual tests) as explained in the section of "Other comments and second call" in this guide.
Lecturing	The contents of the subject will be presented in a organized way. Special emphasis will be put on the fundamentals of the subject and on the most troublesome points. To improve the comprehension, the contents of the next lectures will be announced on Tema platform on a weekly basis.
Problem solving	Each week will devote a time to the resolution by part of the student of exercises or problems proposed, related with the content studied in each moment.
Laboratory practical	Application of theory concepts to laboratory collaborative works.
Autonomous problem solving	The students will be supplied with exercises and problems to solve, the solutions will be provided for level self-evaluation.

Personalized assistance

Methodologies	Description
Autonomous problem solving	The lecturers are at disposal of the students during office hours to solve any question related to the subject contents. The students will be able to verify if the completed assignments are correct and to identify the mistakes of miscalculations. The detailed schedule will be provided to the students at the beginning of the course through the TEMA platform. Any modification will be previously announced.

Assessment

	Description	Qualification	Training and Learning Results
Laboratory practical	Active participation in all classes will be valued, and when applicable, the submission of the lab reports and their content will be assessed according to the guidelines provided by the lecturers. The grading will be on a scale of 0 to 10. The grade obtained will be the same in both the first and second opportunities of the course's examination session.	5	B4 C14 D2 D5 D9 D10 D17
Problem and/or exercise solving	Several tests will be proposed to assess the acquired learning results in the subject. They will consist of problem-solving and/or theoretical questions by the students. None of these tests will exceed 40% of the overall grade for the subject. The tests will be conducted throughout the course during class hours and/or on dates/times approved by the institution. The final test will be performed during the official examination schedule approved by the Comisión Permanente of the School of Industrial Engineering. It will be graded on a scale of 0 to 10. The minimum average grade for all tests will be 4.5/10, with a minimum grade of 4/10 required for each individual test. In the second opportunity of the course's examination session, there will be a single test that encompasses all the content of the subject, carrying a weight of 95% of the final grade. In this case, the minimum mark to pass the subject will be 4.5/10. The duration of the test, as well as the weight of each question, will be provided at the time of the test.	95	B3 C14 D2 B4 D9

Other comments on the Evaluation

It will be necessary to obtain a minimum score of 5 out of 10 to pass the subject. Students who have been granted with the waive of continuous assessment may take the final exam, which will be the 100% of the final mark. This exam will assess the competencies covered in the entire subject.

Comments regarding continuous assessment activities:

The failure to submit lab reports, whether justified or not, will not result in the repetition of the lab practice on a different date.

The dates and locations for all exam sessions will be set by the School of Industrial Engineering before the start of the course and will be made public.

Ethical commitment: it is expected an adequate ethical behavior of the student. If any unethical behavior is detected (cheating, plagiarism, unauthorized use of electronic devices, etc.), it will be considered that the student does not meet the necessary requirements to pass the course. In such cases, the overall rating in the current academic year will be Fail (0.0).

The use of any electronic device for the assessment tests is not allowed unless explicitly authorized. The fact of introducing unauthorized electronic device in the examination room will be considered reason for not passing the subject in the current academic year and will hold overall rating (0.0).

Sources of information

Basic Bibliography

José Antonio González Taboada, **Tensiones y deformaciones en materiales elásticos**, 1st ed., Tórculo, 1997

José Antonio González Taboada, **Fundamentos y problemas de tensiones y deformaciones en materiales elásticos**, 1st ed., Tórculo, 2008

Manuel Vázquez, **Resistencia de Materiales**, 4th ed., Ed. Noela, 2008

Complementary Bibliography

Luis Ortiz Berrocal, **Elasticidad**, 3rd ed., McGraw-Hill, 1998

Robert Mott, Joseph A. Untener, **Applied Strength of Materials**, 6th ed., CRC Press, 2016

Ansel C. Ugural, Saul K. Fenster, **Advanced Mechanics of Materials and Applied Elasticity**, 6th ed., Pearson, 2021

Recommendations

Subjects that it is recommended to have taken before

Physics: Physics 1/V12G360V01102
Physics: Physics 2/V12G360V01202
Mechanics of materials/V12G360V01404

Other comments

To register for this module the student must have passed or be registered for all the modules of the previous years.

The original teaching guide is written in Spanish. In case of discrepancies, shall prevail Spanish version of this guide.