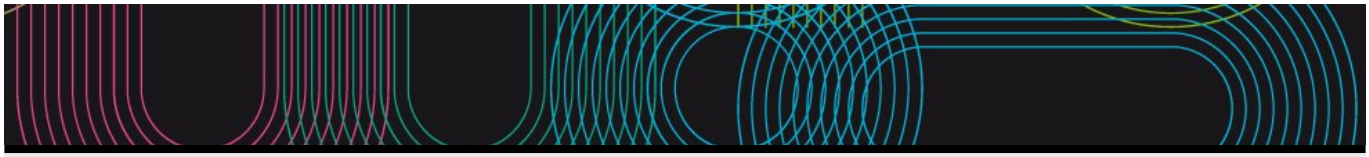

IDENTIFYING DATA				
(*)Elasticidade e ampliación de resistencia de materiais				
Subject	(*)Elasticidade e ampliación de resistencia de materiais			
Code	V12G380V01502			
Study programme	(*)Grao en Enxeñaría Mecánica			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	9	Mandatory	3rd	1st
Teaching language	Spanish English			
Department				
Coordinator	Badaoui Fernández, Aida			
Lecturers	Abia Alonso, Juan Ignacio Baamante Vázquez, Modesto Manuel Antonio Badaoui Fernández, Aida Caneiro Couce, Alfonso Comesaña Piñeiro, Rafael García González, Marcos Lorenzo Mateo, Jaime Alberto Pece Montenegro, Santiago			
E-mail	aida@uvigo.es			
Web				
General description	(*)En esta asignatura se estudiarán los fundamentos de la elasticidad y se profundizará en el estudio de la resistencia de materiales, con el fin de poder aplicar los conocimientos adquiridos al comportamiento de sólidos reales (estructuras, máquinas y elementos resistentes en general). Esta asignatura, junto con la de Resistencia de Materiales, es un soporte de asignaturas más especializadas cuyo objeto es el diseño mecánico.			

Competencies	
Code	
A3	CG3 Knowledge in basic and technological subjects that will enable students to learn new methods and theories, and provide them the versatility to adapt to new situations.
A4	CG4 Ability to solve problems with initiative, decision making, creativity, critical thinking and the ability to communicate and transmit knowledge and skills in the field of industrial engineering.
A35	TM4 Knowledge and skills to apply the fundamentals of elasticity and strength of materials to the actual behavior of solids.
B1	CT1 Analysis and synthesis
B2	CT2 Problems resolution.
B3	CT3 Oral and written proficiency in the own language.
B5	CT5 Information Management.
B9	CS1 Apply knowledge.
B10	CS2 Self learning and work.
B16	CP2 Critical thinking.
B17	CP3 Working as a team.

Learning aims	
Expected results from this subject	Training and Learning Results
Knowledge of the foundations of elasticity theory	A3 A35

Further deepening on mechanics of materials and stress analysis	A3 A4 A35	B2 B10
Knowledge of deformations in beams and shafts	A3 A4 A35	B2 B9
Ability to apply the knowledge of elasticity and mechanics of materials, and to analyze the mechanical performance of machines, structures, and general structural elements	A4 A35	B1 B2 B5 B9
Ability to take decisions about suitable material, shape and dimensions for a structural element subjected to a specific load	A4 A35	B1 B2 B3 B5 B9 B16 B17
Knowledge of different solving methods for structural problems and ability to choose the most suitable method for each specific problem	A4 A35	B1 B2 B5 B9 B16

Contents

Topic	
Fundamentals of elasticity	Introduction to the theory of elasticity Stress analysis of elastic solids Strain Stress-strain relationships Two-dimensional elasticity
Bending. Stress	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
Bending. Deflections	Composite beams
Bending. Statically indeterminate beams	General method Settlements in fixed supports Continuous 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
Buckling	Introduction Buckling and stability Euler's buckling. Critical load Buckling effective length Application limits of Euler's formula. Real buckling Eccentric compression of slim columns Shearing force and critical load
Strain energy and energy methods	Strain energy: Axial load/shearing loads/bending/torsion/general expression. Maxwell-Betti Reciprocal Theorem. Applications Castigliano's theorem. Mohr's integral. Applications
Criteria of failure based in tensions	Saint-Venant's failure criterion Tresca's failure criterion Von-Mises' failure criterion

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	1	0	1
Previous studies / activities	0	6	6
Master Session	20	40	60
Troubleshooting and / or exercises	28	41	69
Laboratory practises	24	6	30
Autonomous troubleshooting and / or exercises	0	20	20
Troubleshooting and / or exercises	2	20	22
Self-assessment tests	0	8	8
Practical tests, real task execution and / or simulated.	3	6	9
*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 / activities	Student previous activities to lectures (compulsory submission): 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 submission of these exercises is indispensable for the students to be examined on the subject.
Master Session	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.
Troubleshooting and / or exercises	Each week will devote a time to the resolution by part of the student of exercises or problems proposed, related with the content that was seeing in the moment.
Laboratory practises	Application of theory concepts to laboratory collaborative works.
Autonomous troubleshooting and / or exercises	The students will be supplied with exercises and problems to solve, the solutions will be provided for level self-evaluation.

Personalized attention

Methodologies	Description
Autonomous troubleshooting and / or exercises	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
Laboratory practises	Attendance and active participation in the complete laboratory lessons will be graded from 0 to 10, provided that the student gets a minimum mark in the written examination (minimum mark: 4.5/10).	5
Troubleshooting and / or exercises	Exam for the assessment of the module learning outcomes. The exam comprises of brief problems and/or theoretical questions. The duration and precise grading will be communicated at the beginning of the exam.	80
Practical tests, real task execution and / or simulated.	Short exercises and conceptual tests will be taken during the course (within lecture or laboratory hours; grading from 0 to 10). The mark will be added to the exam mark, provided that the student gets a minimum mark in the written examination (minimum mark: 4.0/10).	15

Other comments on the Evaluation

In this module the minimum required mark to pass is 5 out of 10.

The written examination of students not able to attend laboratory sessions will be graded 100% of the module mark, provided the student resigns from continuous assessment (and gets the required school approval) within the period

established for that purpose. This examination will assess the subject overall competencies.

The qualification obtained in the laboratory practices in the course 2012/2013 (5% of the qualification) will be preserved, provided the student requests that within an established period in the beginning of the course.

Group responsible lecturer:

Group M1: Aida Badaoui Fernández

Group with teaching in English: Rafael Comesaña Piñeiro (racomesana@uvigo.es)

Sources of information
José Antonio González Taboada, **Tensiones y deformaciones en materiales elásticos**, 2a Edición,
José Antonio González Taboada, **Fundamentos y problemas de tensiones y deformaciones en materiales elásticos**, 1a Edición,
Manuel Vázquez, **Resistencia de Materiales**,
Luis Ortiz-Berrocal, **Elasticidad**, 3a Edición,
Recommended: Hibbeler R.C., **Mechanics of Materials, SI Edition**, 8th Edition in SI units,
Complementary: Timoshenko, Goodier., **Theory of elasticity**, 3rd ed., International student ed.,

Reading list for the group in English:

Recommended:

- Hibbeler R.C., Mechanics of Materials, SI Edition, Prentice Hall.

- José Antonio González Taboada , Tensiones y deformaciones en materiales elásticos, 2a Edición, Tórculo.

- José Antonio González Taboada , Fundamentos y problemas de tensiones y deformaciones en materiales elásticos, 1a Edición, Tórculo.

Complementary:

- Timoshenko, Goodier, Theory of elasticity, 3rd ed., (International student ed.), McGraw-Hill

- Manuel Vázquez , Resistencia de Materiales.

Recommendations
Subjects that continue the syllabus
(*)Deseño de máquinas I/V12G380V01304
(*)Teoría de estruturas e construcións industriais/V12G380V01603

Subjects that it is recommended to have taken before
(*)Física: Física I/V12G380V01102
(*)Física: Física II/V12G380V01202
(*)Resistencia de materiais/V12G380V01402