Teaching Guide				
Identifying Data				2024/25
Subject (*)	Advanced manufacturing techniques		Code	730G04075
Study programme	Grao en Enxeñaría en Tecnoloxías Industriais			
Descriptors				
Cycle	Period	Year	Type	Credits
Graduate	2nd four-month period	Fourth	Optional	6
Language	Spanish			
Teaching method	Face-to-face			
Prerequisites				
Department	Enxeñaría Naval e Industrial			
Coordinador	Nicolas Costa, Gines	E-mail	gines.nicolas@udc.es	
Lecturers	Nicolas Costa, Gines	E-mail	gines.nicolas@udc.es	
Web				
General description	The objective of this subject is to make a brief introduction to the fundamentals of laser technology and its main applications in the industry, focusing especially on the applications available in our laboratory. The orientation of the teaching has a high practical content and of beginning the investigation that is developed by means of a tutored work.			

Study programme competences / results	
Code	Study programme competences / results
B5	CB5 Que os estudantes desenvolvan aquelas habilidades de aprendizaxe necesarias para emprenderen estudos posteriores cun alto grao de autonomía
B7	B5 Ser capaz de realizar unha análise crítica, avaliación e síntese de ideas novas e complexas
B9	B8 Adquirir unha formación metodolóxica que garanta o desenvolvemento de proxectos de investigación (de carácter cuantitativo e/ou cualitativo) cunha finalidade estratéxica e que contribúan a situarnos na vangarda do coñecemento

Learning outcomes			
Learning outcomes	Study programme competences / results		
Knowledge of the fundamentals and technological aspects of new fabrication processes Knowledge of the laser Analysis, critical evaluation and synthesis of the mentioned technologies		B5 B7 B9	

Contents	
Topic	Sub-topic
Manufacturing processes with high energy density beams	Laser technology (fundamentals, systems, applications, security) Materials processing with other techniques
Additive manufacturing processes	Laser cladding 3D printing
Micromanufacturing	Laser ablation X-ray lithography Focused ion beam
Monitoring techniques and process control	Review of the different techniques of interferometry, holography, speckle and scattering Applications to the measurements of displacements, form defects, superficial characterization and velocimetry Analytical and characterization techniques based on laser spectroscopy: laser induced fluorescence, laser induced plasma spectroscopy

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Guest lecture / keynote speech	B5 B7 B9	21	42	63
Laboratory practice	B5 B7	14	33	47
Supervised projects	B5 B7 B9	7	30	37
Personalized attention		3	0	3
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Guest lecture / keynote speech	Theoretical lessons
Laboratory practice	Session of laboratory practices of each of the thematic blocks
Supervised projects	Realization of a bibliographic, theoretical, numerical and/or practical work

Personalized attention	
Methodologies	Description
Supervised projects Guest lecture / keynote speech Laboratory practice	Doubts resolution of the theory and practical works.

Assessment			
Methodologies	Competencies / Results	Description	Qualification
Supervised projects	B5 B7 B9	A memory of work will be presented and defended in front of professors and students of the course.	100

Assessment comments
It is required to attend 75% of the lectures and all the laboratory practices. Students with recognition of part-time dedication DO NOT have an academic exemption of attendance exemption for Laboratory Practices, although they will be given facilities regarding the dates of completion prior communication. The criteria and evaluation activities for this student will be the same as for the rest of the students. The evaluation criteria in the 2nd opportunity and in the forward one are the same as those in the 1st opportunity.

Sources of information	
Basic	- L. R. Migliore (1996). Laser materials processing. Marcel Dekker - W. M. Steen, J. Mazumder (2010). Laser material processing. Springer - W. Demtröder (1996). Laser spectroscopy basic concepts and instrumentation. Berlin: Springer - T. Yoshizawa (ed) (2009). Handbook of optical metrology : principles and applications. CRC Press (Boca Raton) - J. Brown (1998). Advanced machining technology Handbook. New York: McGraw-Hill - J. P. Davim (ed) (2008). Machining-Fundamentals and recent advances. London: Springer-Verlag - J. P. Davim, M. J. Jackson (ed) (2009). Nano and micromachining. John Wiley & Sons - P. Molera (1989). Electromecanizado. Electroerosión y mecanizado electroquímico. Barcelona: Marcombo

Complementary	- J. Dowden (ed.) (2009). The theory of laser materials processing. Springer - M. Lackner (ed) (2008). Lasers in chemistry. Wiley-VCH - P. Schaaf (ed) (2010). Laser processing of materials. Springer - H. H. Telle (2007). Laser chemistry: spectroscopy, dynamics and applications . West Sussex, John Wiley & Sons - P. Hering, J. P. Lay, S. Stry (2004). Laser in environmental and life sciences: modern analytical methods. Springer - J.P. Singh y S.N. Thakur (2006). Laser-induced Breakdown Spectroscopy. Amsterdam: Elsevier Science BV - D.A. Cremers y L.J. Radziemski (2006). Handbook of Laser-induced Breakdown Spectroscopy. Chichester: Wiley

Recommendations
Subjects that it is recommended to have taken before
Subjects that are recommended to be taken simultaneously
Subjects that continue the syllabus
Other comments
To help achieve a sustained immediate environment and meet the goal of action number 5: "Healthy and environmental and social teaching and research" of the "Green Campus Ferrol Action Plan", the following recommendations are made: -Make a sustainable use of resources and the prevention of negative impacts on the natural environment -The delivery of the documentary works that are made in this matter: ? It will be done through Moodle, in digital format without the need to print them ? If it is necessary to make them on paper: - Plastics will not be used - Double-sided prints will be made. - Recycled paper will be used. - The printing of drafts will be avoided. In general, sustainable use of resources will be made and negative impacts on the natural environment will be avoided as far as possible. In addition, the importance of ethical principles related to sustainability values in personal and professional behaviors will be taken into account.As stated in the different regulations applicable to university teaching, the gender perspective will be incorporated in this area (non-sexist language will be used, bibliography of authors of both sexes will be used, the intervention in class of students will be encouraged ...). Work will be done to identify and modify prejudices and sexist attitudes, and the environment will be influenced to modify them and promote values of respect and equality. Situations of discrimination based on gender will be detected and actions and measures will be proposed to correct them. The full integration of students who, for physical, sensory, mental or sociocultural reasons, experience difficulties with suitable, equal and profitable access to university life will be facilitated.