Teaching Guide				
Identifying Data				2021/22
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.			
Contingency plan	1. Modifications to the contents 2. Methodologies *Teaching methodologies that are maintained *Teaching methodologies that are modified 3. Mechanisms for personalized attention to students 4. Modifications in the evaluation *Evaluation observations: 5. Modifications to the bibliography or webgraphy			

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	28	42
Supervised projects	B5 B7 B9	7	35	42
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. A supervisor will be assigned to each student.

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	- Leonard R. Migliore (1996). Laser materials processing. Marcel Dekker - William M. Steen, Jyotirmoy Mazumder (2010). Laser material processing. Springer - Demtröder, Wolfgang (1996). Laser spectroscopy basic concepts and instrumentation. Berlin: Springer - Toru Yoshizawa (ed) (2009). Handbook of optical metrology : principles and applications. CRC Press (Boca Raton) - James Brown (1998). Advanced machining technology Handbook. New York: McGraw-Hill - J. Paulo Davim (ed) (2008). Machining-Fundamentals and recent advances. London: Springer-Verlag - J. Paulo Davim, Mark J. Jackson (ed) (2009). Nano and micromachining. John Wiley & Sons - Pere Molera (1989). Electromecanizado. Electroerosión y mecanizado electroquímico. Barcelona: Marcombo
Complementary	- John Dowden (ed.) (2009). The theory of laser materials processing. Springer - Maximilian Lackner (ed) (2008). Lasers in chemistry. Wiley-VCH - P. Schaaf (ed) (2010). Laser processing of materials. Springer - Telle, Helmet H. (2007). Laser chemistry: spectroscopy, dynamics and applications . West Sussex, John Wiley & Sons - Peter Hering, Jan Peter Lay, Sandra 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.

(*)The teaching guide is the document in which the URV publishes the information about all its courses. It is a public document and cannot be modified. Only in exceptional cases can it be revised by the competent agent or duly revised so that it is in line with current legislation.