Teaching Guide				
Identifying Data				2022/23
Subject (*)	Thermal treatments and analysis by laser		Code	730495007
Study programme	Mestrado Universitario en Materiais Complexos: Análise Térmica e Reoloxía (plan 2012)			
Descriptors				
Cycle	Period	Year	Type	Credits
Official Master's Degree	2nd four-month period	First	Optional	2
Language	English			
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	This course aims to describe the characterization of materials by laser analysis (especially on plasma emission spectroscopy induced by laser) and induced thermal effects.			

Study programme competences / results	
Code	Study programme competences / results
A1	Set up and conduct tests using the techniques of thermal analysis and rheology most appropriate in each case, within the scope of complex materials
A5	Understanding the relationships between structure and properties of materials
B2	The students have the skill to apply their knowledge and their ability to solve problems in new or unfamiliar contexts within broader (or multidisciplinary) contexts related to their field of study
B3	That students are able to integrate knowledge and handle complexity, and formulate judgments from an information that, being limited or not complete, includes reflections on the social and ethical responsibilities linked to the application of their knowledge and judgments
B4	That the students can communicate their conclusions and the knowledge and last reasons behind that conclusions to specialized and non specialized audience in a clear and unambiguous way
B8	Applying a critical, logical and creative way of thinking
B13	Analysis-oriented attitude
B21	To assess the importance of research, innovation and technological developments in the socio-economic and cultural progress of society
C2	Have a good command of spoken and writing expression and understanding of a foreign language.
C4	Developing for the exercise of an open, educated, critical, committed, democratic and solidary citicenship, able to analyze reality, diagnose problems, formulate and implement solutions based on knowledge and oriented to the common good.
C6	Critically assessing the knowledge, technology and information available to solve the problems they face with.
C7	To assume as a professional and citizen the importance of learning throughout life.
C8	To assess the importance of research, innovation and technological development in the socio-economic and cultural progress of society.

Learning outcomes			
Learning outcomes	Study programme competences / results		
Knowledge of the laser concepts and laser-interaction fundamentals	AR1	BR2	CR2
Knowledge of the processes about laser materials treatments	AR5	BR3	CR4
Knowledge of the processes about laser materials analyses		BR4	CR6
		BR8	CR7
		BR13	CR8
		BR21	

Contents

Topic	Sub-topic
The following blocks or topics develop the contents established in the Verification Report, which are:	Laser irradiation of the material and subsequent thermal effects. Treatments by laser heating. Laser-based instrumental methods for analysis and characterization of materials.
1. Laser fundamentals	1.1 Basic laser mechanisms 1.2 Optics and beam manipulation 1.3 Types of lasers
2. Laser heat treatment	2.1 Interaction phenomena 2.2 Basic regimes of the heating 2.3 Types of heat treatments
3. Laser analysis	3.1 Fundamentals of laser spectroscopy 3.2 Types of laser spectroscopy techniques 3.3 Laser induced plasma spectroscopy

Planning				
Methodologies / tests	Competencies / Results	Teaching hours (in-person & virtual)	Student?s personal work hours	Total hours
Document analysis	B2 B3 B4 B8 B13 C2 C4 C6 C7 C8	2	12	14
Laboratory practice	A1 B2 B4 B8 B13 C6	4	12	16
Guest lecture / keynote speech	A1 A5 B21 C2	8	10	18
Personalized attention		2	0	2
(*)The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.				

Methodologies	
Methodologies	Description
Document analysis	Work will be made on a specific technique based on scientific papers
Laboratory practice	Experimental session in the Industrial Applications Laboratory
Guest lecture / keynote speech	Presentation with slides

Personalized attention	
Methodologies	Description
Document analysis	Discussion about how focusing the report No academic dispensation accepted.

Assessment			
Methodologies	Competencies / Results	Description	**Qualification**
Document analysis	B2 B3 B4 B8 B13 C2 C4 C6 C7 C8	Quality of the scientific report about the proposed theme	100

Assessment comments

The evaluation criteria in the 2nd opportunity and in the forward one are the same as those in the 1st opportunity. 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.

Sources of information	
Basic	- C.D. Davis (1996). Lasers and Electro-Optics. Cambridge - A.M. Prokhorov (1990). Laser Heating of Metals. Adam Hilger - W. Demtröder (1996). Laser spectroscopy basic concepts and instrumentation. Springer - D.A. Cremers (2006). Handbook of Laser-induced Breakdown Spectroscopy. Wiley
Complementary	

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.