



Teaching Guide						
Identifying Data				2020/21		
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.					
Contingency plan	<p>1. Modifications to the contents - No changes are made</p> <p>2. Methodologies *Teaching methodologies that are maintained - Master Session - Laboratory practices - Supervised work (with personalized attention)</p> <p>*Teaching methodologies that are modified</p> <p>3. Mechanisms for personalized attention to students - Email: Daily. To make queries, request virtual meetings, resolve doubts and monitor the work being supervised. - Moodle: Daily depending on the needs of the students. They have "thematic forums associated to the modules" of the subject to formulate the necessary consultations. They also have "specific activity forums" to develop the "directed discussions", through which the development of theoretical contents of the subject is put into practice. - Teams: Individual or small group sessions for the follow-up and support in the realization of the "supervised works". This dynamic allows to make a normalized monitoring and adjusted to the learning needs of the students to develop the work of the subject.</p> <p>4. Modifications in the evaluation - No changes are made</p> <p>*Evaluation observations:</p> <p>5. Modifications to the bibliography or webgraphy - No changes are made</p>					

Study programme competences	
Code	Study programme competences
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 citizenship, 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
Knowledge of the laser concepts and laser-interaction fundamentals		AR1	CR2
Knowledge of the processes about laser materials treatments		AR5	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	Ordinary class hours	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	12	6	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	
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	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 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.	

(*)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.