



## Teaching Guide

Identifying Data					2024/25
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 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 / 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.

All aspects related to academic dispensation, dedication to study, permanence and academic fraud will be governed in accordance with the academic regulations in force at the UDC.

## Sources of information

- |                      |   |
|----------------------|---|
| <b>Basic</b>         | <ul style="list-style-type: none"><li>- C.D. Davis (1996). Lasers and Electro-Optics. Cambridge</li><li>- A.M. Prokhorov (1990). Laser Heating of Metals. Adam Hilger</li><li>- W. Demtröder (1996). Laser spectroscopy basic concepts and instrumentation. Springer</li><li>- D.A. Cremers (2006). Handbook of Laser-induced Breakdown Spectroscopy. Wiley</li></ul> |
| <b>Complementary</b> |   |

## 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.&nbsp;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.&nbsp;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.

(\*)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.