



IDENTIFYING DATA

Metrological Laser Applications

Subject	Metrological Laser Applications			
Code	O01M117V01201			
Study programme	(*)Máster Universitario en Fotónica e Tecnoloxías do Láser			
Descriptors	ECTS Credits	Choose	Year	Quadmester
	6	Optional	1st	2nd
Teaching language				
Department				
Coordinator	Vázquez Dorrío, José Benito			
Lecturers	Blanco García, Jesús López Vázquez, José Carlos Trillo Yáñez, María Cristina Vázquez Dorrío, José Benito			
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Web	http://laserphotonics.org			
General description	The subject "Metrological Applications of Lasers" is an optional one, generalist and practical whose essential objective is to know the solutions that the technical laser offers in the field of metrology, providing a panoramic vision of the different methods and optical technologies of measure and industrial inspection. It intends to deepen in the theoretical and practical knowledge of the main optical techniques of measure in three areas of big current interest how field interferometry and evaluation of phase, the inspection of surfaces and the TV-holography. These contents provide a wide base of knowledges that allows the back acquisition of the necessary skills both theoretical and practical, in relation with the professional performance and focused the field of photonics and laser technologies.			

Competencies

Code	
C4	Capacity for identification and description of optical laser sensors and actuators , including integrated sensors and optical fibers and their applications in various fields and recognition of commercial systems.
D3	Skill in interpersonal relationships.
D4	Capacity for independent learning, self-organization and self-scheduling of work, and to maintain continuous training in their field of work.

Learning outcomes

Expected results from this subject	Training and Learning Results
Know the concepts, models and fundamental theories of optical metrology that allow the students a scientific interpretation of the process of measure and serve of base for back learnings more specific and/or technical.	C4
Comprise that optical metrology is a technical knowledge with limitations and subjected to review and continuous evolution, due to a process of technology-science interaction and tied to the characteristics and to the needs of the society in each historical moment.	D4
Propose and develop solutions of daily phenomena and problems, using the techniques of optical metrology.	
Apply the theoretical knowledges to the resolution of metrological problems developing suitable strategies.	C4 D4
Use with autonomy characteristic strategies of the investigation and of the scientific procedures, within the scope of the optical metrology, to perform small investigations and, in general, explore situations or strange phenomena	C4 D3

Develop own values of the dynamics of the scientific thought, showing a flexible and open attitude in front C4 of opinions or diverse situations.

Take conscience of the need of a training and continuous improvement of quality.

D4

Contents

Topic

Generalities	Introduction. General characteristics of the systems of optical measurement. The laser in metrology Measurable attributes by optical means. Ranking of the optical techniques of dimensional metrology.
Interferometric field techniques	Two-beam interferometers Multiple beam interferometers Applications. Automatic analysis of interferograms. Design of algorithms of displacement of phase.
Techniques of inspection of surfaces	Surface topography. Rugosity. Macrodefects. Needle perfilometers (stylus). Optica perfilometers. . Parametric optical techniques for the measure of rugosity.
Optical techniques stop the industrial inspection of defects	Panorama of optical reflectometric techniques for industrial inspection. Practical case: inspection of cracks in tubes of heat interchangers by means of a reflectometric fibre sensor. Introduction to the techniques of inspection of defects by means of holographic interferometry and TV-holography. Description of TV holography: Geometry, temporary treatment, secondary fringes and evaluation of phase. Practical case: detection by means of TV-holography of ultrasonic wave propagation for the detection of cracks in metallic plates.

Planning

	Class hours	Hours outside the classroom	Total hours
Troubleshooting and / or exercises	10	0	10
Autonomous troubleshooting and / or exercises	0	100	100
Master Session	38	0	38
Multiple choice tests	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

	Description
Troubleshooting and / or exercises	The professor will resolve the exercises and problems that will serve of model stop those that the student will owe to resolve of autonomous way.
Autonomous troubleshooting and / or exercises	The student will resolve of autonomous way the problems and exercises proposed for the subject
Master Session	The professor will expose the main concepts of the subject with the support of the opportune teaching material available online.

Personalized attention

Methodologies	Description
Autonomous troubleshooting and / or exercises	Voluntary tutorship. Help in the realization of the different tasks (individual or collective)

Assessment

	Description	Qualification	Training and Learning Results
Autonomous troubleshooting and / or exercises	Periodic delivery of collections of problems realized of autonomous way.	50	C4 D3 D4
Multiple choice tests	Test with multiple options question	50	C4 D3 D4

Other comments on the Evaluation

The evaluation tries to be continuous and realized through proposals of individual resolution and type test. Can be caught up

with maximum qualification carrying out these tasks. In the case of had not realized the continuous evaluation the students will be able to realize a final examination in the dates and place that appears in the web of the master:

#<http://master.laserphotonics.org/>

Sources of information

D. Malacara, **Optical Shop Testing**, John Wiley & Sons,

G. Cloud, **Optical Methods of Engineering Analysis**, Cambridge University Press,

P. Cielo, **Optical Techniques for Industrial Inspection**, Academic Press,

Recommendations