Universida_{de}Vigo

IDENTIFYING DATA
(*)Técnicas non destructivas para a avaliación do patrimonio cultural inmoble

Subject	(*)Técnicas non destructivas para a avaliación do patrimonio cultural inmoble			
Code	O02M143V03218			
Study programme	(*)Máster Universitario en Valoración, xestión e protección do patrimonio cultural			

Descriptors	ECTS Credits	Choose	Year	Quadmester
	3	Optional	1st	2nd

Teaching language	Spanish Galician
Department	
Coordinator	Riveiro Rodríguez, Belén
Lecturers	Lagüela López, Susana Riveiro Rodríguez, Belén Solla Carracelas, María Mercedes
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General description	This subject aims to train the student to know different techniques of non-destructive evaluation (NDT) of the built cultural heritage. It is intended that the student, through the use of different NDT techniques, be able to interpret pathologies or structural aspects at a superficial and internal level that help to preserve the immovable cultural heritage.

Competencies

Code	
A2	That students know how to apply the knowledge acquired and their ability to solve problems in new or unfamiliar environments within broader (or multidisciplinary) contexts related to their area of study.
B2	Acquire the necessary knowledge to handle the different tools of graphic, dimensional and geospatial documentation to be applied in the documentation and valuation of Cultural Heritage.
B3	Acquire the ability to bring to the practical application of the protection of cultural property the theoretical knowledge and the protocols of documentation, diagnosis and evaluation.
C2	Acquire the ability to design intervention protocols, establishing types, priorities and intensities of action before a cultural property at risk of alteration.
C7	Know the basics of the most used non-destructive techniques for the sub-surface prospecting of the cultural heritage and develop the ability to determine its applicability to specific cases.
D4	To be able to integrate the diverse information and data contributed by diverse technicians and tools in the writing of conclusions of action.
D5	Be able to predict and control the evolution of complex situations through the development of new and innovative work methodologies adapted to the specific scientific / research, technological or professional field, in general multidisciplinary, in which their activity is developed.

Learning outcomes

Expected results from this subject	Training and Learning Results			
Know different methods of non-destructive evaluation, the applicability of each one as well as its advantages and disadvantages	A2	B2 B3	C2 C7	D4 D5
Know how to interpret results obtained from different END techniques and the combination of those results for a more complete analysis of the structure	A2	B2 B3	C2 C7	D4 D5

Contents

Topic	
Introduction to non-destructive techniques and application in the evaluation of the immovable cultural heritage.	The non-destructive techniques for evaluation of heritage elements. Application examples
Applicability of photogrammetry and laser scanner for surface evaluation.	Processing of orthophotos in the laboratory Interpretation of results.
Applicability of thermography for subsurface inspection.	Processing of thermographic images in the laboratory. Interpretation of results
Applicability of the georadar for internal inspection.	Processing of 2D and 3D radargrams in the laboratory. Interpretation of results.
Integration of non-destructive techniques for the study of the built cultural heritage.	Design and planning of an integration project.

Planning

	Class hours	Hours outside the classroom	Total hours
Introductory activities	0.5	0	0.5
Seminars	4	4	8
Case studies	0.5	15	15.5
Problem solving	0	19	19
Autonomous practices through ICT	0	30	30
Essay	1	0	1
Systematic observation	0	1	1

*The information in the planning table is for guidance only and does not take into account the heterogeneity of the students.

Methodologies

	Description
Introductory activities	Activities directed to take contact and gather information on the students, as well as to present the module. They will present the module outline form of the matter, aims, calendar, criteria of evaluation, as well as forums of debate and news and other surroundings in which it will manage the learning.
Seminars	Activities focused to the work on each one of the technologies that present in the matter, so that the students can understand the theoretical principles of each technician to the time that take contact with the tools software that will allow them put in technical said practice during a process of documentation. These seminars will realise by means of videoconference and totorial videosl, on the studies of case of employment of each technician.
Case studies	Analysis of a problem or real case, with the purpose to know it, interpret it, resolve it, generate hypothesis, diagnose it and get introduced to alternative procedures of solution, to see the application of the theoretical concepts in the reality. They will employ as I complement of the theoretical classes for the autolearning.
Problem solving	Activities in which they formulate problems and/or exercises related with the matter.
Autonomous practices through ICT	Activities of application of the knowledges to concrete situations and of acquisition of basic skills and procedures related with the matter object of study. It develops through the TIC of autonomous way.

Personalized assistance

Methodologies	Description
Case studies	Resolution of doubts and personalised attention of the work performed by the students. Resources used: platform for virtual teaching Moodle, and videoconference and e-meeting
Problem solving	Resolution of doubts and personalised attention through the videoconference and e-meeting.
Autonomous practices through ICT	Information and personalised consultancy of the autonomous practices realised by the students through the TIC. Resources used: platform of virtual teaching Moodle and videoconference and e-meeting.

Assessment

Description	Qualification	Training and Learning Results

Essay	The student presents the result obtained in the elaboration of a document on the subject matter in the preparation of seminars, investigations, memories, essays, summaries of readings, conferences, etc. The learning outcomes are the student's training for documentation through non-destructive techniques of heritage assets. It is intended that the student is able to document the physical and formal characteristics and the state of conservation of the real cultural heritage and its immediate surroundings.	80	A2 B2 C2 D4 B3 C7 D5	
Systematic observation	The performance of the student is being observed, as well as the practices and seminars through the telematic tools. The results of the learning are the qualification of the student for the documentation of the heritage using non-destructive techniques.	20	A2 B2 C2 D4 B3 C7 D5	

Other comments on the Evaluation

The student, according to the valid rule, has two announcements of evaluation. The first carries out during the teaching period. In the case that the weeks of teaching of the matter are not sufficient for the delivery of all the planned works, will enable the platform of teaching two additional weeks, at the end of the semester, to facilitate works delivery, establishing in this case an alternative calendar of delivery of tasks. The second evaluation is in the month of July, for which will enable again the access to the educational platform.

Sources of information

Basic Bibliography

Belén Riveiro, Mercedes Solla, **Non-Destructive Techniques for the Evaluation of Structures and Infrastructure**, CRC Press - Taylor and Francis, 2016

Complementary Bibliography

Luisa Maria da Silva Gonçalves, Hugo Rodrigues, Florindo Gaspar, **Nondestructive Techniques for the Assessment and Preservation of Historic Structures**, CRC Press - Taylor and Francis, 2017

Dean Goodman, Salvatore Piro, **GPR Remote Sensing in Archaeology**, Springer, 2013

Kylily, A., Fokaides, P., Christou, P., Kalogirou, S., **Infrared thermography (IRT) applications for building diagnostics: A review.**, 2014

Solla, M., Riveiro, B., Lagüela, S., Puente, I., **Optical and Electromagnetic Sensing for the Inspection and Characterization of Ancient Masonry Arch Bridges**, Taylor & Francis, 2017

Recommendations

Subjects that continue the syllabus

(*)Introdución á avaliación estructural de construcións patrimoniais/O02M143V03217

Subjects that it is recommended to have taken before

(*)Introducción á topografía e produción cartográfica/O02M143V03111

2D and 3D Cartographic Documentation Techniques for Cultural Heritage/O02M143V03109

Prospecting Techniques for Surface Subsoil/O02M143V03110

CAD Techniques to Present Heritage/O02M143V03107

Other comments

The teaching of the matter carries out using the educational platform Moodle and, of face-to-face way, participating in the educational activities through videoconference or through tools of remote connection (as it Adobe Connect). To be able to receive the teaching of effective way, recommends , previously to the start of the matter, consult the manual of access to the platform and follow the technical specifications to be able to assist to the remote sessions. This information is available in the common space of the Master. It is indispensable that the student access to the educational platform of the matter previously to the start of the same.

In general, for the practices will employ free software or free versions (demo) of commercial software for operating system Windows 7.