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, Gestión y Protección del Patrimonio Cultural

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

Teaching language	#EnglishFriendly Spanish Galician
Department	
Coordinator	Solla Carracelas, María Mercedes
Lecturers	Lagüela López, Susana Solla Carracelas, María Mercedes
E-mail	merchisolla@uvigo.es
Web	http://moovi.uvigo.gal/course/view.php?id=1081
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. English Friendly subject: International students may request from the teachers: a) resources and bibliographic references in English, b) tutoring sessions in English, c) exams and assessments in English.

Training and Learning Results

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.

Expected results from this subject

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	0.5	1	1.5
Case studies	3	30	33
Lecturing	2	10	12
Case studies	0	7	7
Essay questions exam	0	2	2
Case studies	0	7	7
Case studies	0	7	7
Essay	0	5	5

*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.
Lecturing	Presentation of theoretical and practical contents through the virtual platform. Activities of application of knowledge to specific situations and acquisition of basic and procedural skills related to the subject.

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 (Remote Campus)
Lecturing	Resolution of doubts and personalized attention. Resources used: platform for virtual teaching Moodle, and videoconference (Remote Campus)

Assessment

	Description	Qualification	Training and Learning Results
Case studies	Activities in the didactic unit 2 to develop case studies in which a situation already existent, or that can occur, is given, starting from the different factors involved, the analysis of the antecedents, conditions of the situation, 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.	20	A2 B2 C2 D4 B3 C7 D5
Essay questions exam	Essay test in the didactic unit 5 in which students have to demonstrate their understanding of the most theoretical-practical concepts of the subject.	20	A2 B2 C2 D4 B3 C7 D5
Case studies	Activities in the didactic unit 3 to develop case studies in which a situation already existent, or that can occur, is given, starting from the different factors involved, the analysis of the antecedents, conditions of the situation, 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.	20	A2 B2 C2 D4 B3 C7 D5
Case studies	Activities in the didactic unit 4 to develop case studies in which a situation already existent, or that can occur, is given, starting from the different factors involved, the analysis of the antecedents, conditions of the situation, 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.	20	A2 B2 C2 D4 B3 C7 D5
Essay	Review of a scientific article in which they integrate different non destructive techniques for the evaluation of the Cultural Heritage Real estate. Delivery of the report of review.	20	A2 B2 C2 D4 B3 C7 D5

Other comments on the Evaluation

According to the 2023 "*Regulation on the evaluation, qualification and quality of teaching and the student learning process of the University of Vigo*", there are two evaluation systems that students can choose: the preferred one, which will be applied by default, of "**continuous evaluation**" (diversified tests and activities that take place throughout the semester), and the so-called "**global evaluation**" (tests and/or delivery of work/exercises to be carried out on the official dates of evaluation established in the academic calendar), which must be expressly requested by the interested students, and communicated to the responsible teaching staff within a maximum period of 31 days from the beginning of each term.

The "**global evaluation**" tests for this subject will consist as follows: essay questions exam (20%), case studies corresponding to the didactic units 2, 3 and 4 (60%, (20% each one)) and essay (20%).

Students have two evaluation calls/opportunities. The first is carried out during the teaching semester. The second (or 2nd opportunity) will take place in the month of July, for which access to the teaching platform will be enabled again.

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 producción 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 subject will be always of face-to-face telematic way, well was synchronous or asynchronous, using the eMoodle (MooVi) educational platform and participating in the educational activities through multiple videoconference (Remote Campus).

To be able to receive the teaching of effective way it si recommended , previously to the start of the subject, to consult the manual of access to the platform and to follow the technical specifications in order to assist to the remote sessions. It is indispensable that each student access to the educational platform of the subject previously to the beginning of the same. In general, for the practices will employ free software or free versions (demo) of commercial software for operating system Windows 7.