IPS Instituto Politécnico de Setúbal
Escola Superior de Tecnologia do Barreiro

Curriculum Unit Sheet

Science, Technology and Materials Degradation

Academic Year:

2018/2019

Course	Master's degree in Conservation and Rehabilitation								
Scientific Area	Conservation and Rehabilitation								
ECTS Credits	6,5	**Curriculum Unit code**	CTDM	**Year**	1	**Semester**	1	**Type**	Compulsory
Prerequisites									

Contact Hours:

Lecture Sessions		**Lecture-Practical Sessions**	60	**Practical and Laboratory Sessions**	
Tutorial		**Placement**		**Seminar**	
Fieldwork		**Other**	7,5	**Autonomous Study**	108

Responsible	Cristiana Nadir Gonilho Pereira	**Position**	Professor Adjunto
Lecturers		**Position**	

Learning Outcomes

Provide technical-scientific knowledge in the field of building materials, namely natural stone, cement and additives, mortars, concrete, ceramics, woods, metals, polymers, composites and new construction materials, through the analysis of raw materials, processing, properties and their evaluation, mechanisms of deterioration, applications and normalization applied. Special attention will be given to materials used in conservation and rehabilitation operations and compatibility between materials.
Provide students with knowledge and skills related to the experimental / laboratory activity.

Syllabus

1. Materials Science and Engineering: Classification. Phases diagram. Properties.
2. Metallic materials: Ferrous and Non-ferrous. Anomalies: Corrosion; Prevention and Protection.
3. Polymer materials: Monomer and polymer; Polymerization; Degree of crystallinity. Effect of temperature and properties. Anomalies: Classification and type of degradation. Durability.
4. Composite materials: Definition. Polymer matrix composites. Anomalies of composite materials.
5. Mortars: Air lime, pozzolans, hydraulic lime and cement. Composition and Properties. Anomalies.
6. Concrete: Prescription. Aptitude mixer binder. Composition and Properties. Anomalies.
7. Wood: Structure and Properties. Pathology. Degradation. Conservation and protection.
8. Natural Stone: Rock in the mass versus stone in the building. Description. Pathology. Conservation.
9. Ceramics: Raw materials, properties. Pathology of ceramic materials.

Teaching Methodologies

In TP classes the fundamental concepts will be taught by exposure, using audiovisual means and some illustrative problems of these concepts will be discussed.
In the more practical classes, the students will individually solve exercises proposed by the teacher.
Part of the teaching activities will be taught in laboratory classes where the students participate, in group, making sure that, in applying the acquired knowledge, they develop laboratory skills.

Evaluation

- Technical / Seminar Report (s) with a global weight of 50% in the final evaluation.
- Test / Exam, weighing 50% in the final evaluation.

Evidence of the syllabus coherence with the curricular unit's intended learning outcomes

The fundamental objective of the CU is the development of competencies that allow the student to understand the properties and behaviors of materials, due to their microstructure and physical-chemical characteristics and to acquire basic knowledge about the phenomenon of material degradation. It is also intended that this knowledge serve as the basis for more advanced curricular units. For this reason, the content of the 1st chapter refers to the classification of materials and their properties and the remaining chapters deal with the main groups of materials. In these, generally, raw materials, processing techniques, properties and their evaluation, mechanisms and types of degradation, prevention, protection and conservation are analyzed. Therefore, it is guaranteed that the student acquires knowledge and skills that allows him to analyze the behavior of the materials, in an organized and systematic way, allowing him to predict expected behaviors.

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Evidence of the teaching methodologies coherence with the curricular unit's intended learning	The fundamental objective of CU is the development of competencies that allow the student to understand the properties and behaviors of materials. These contents to be accurately learned by the students, should be taught in a solid and consistent manner, with the use of theoretical lectures. In order for knowledge to be consolidated it is necessary that a significant number of problems be applied by the teacher and individually by the students, which is why a significant number of practical classes are undertaken (Technical / Seminar Report (s))). Finally, the consolidation of these concepts is carried out through the accomplishment of laboratory activities, analysis of these results and presentation of the respective reports. Laboratory classes are planned in this CU, in which students will work in groups.
Bibliography	ASHBY, Michael; JONES, D. R. (2005), Engineering Materials: An Introduction to Microstructures, Processing and Design — 3ª ed, Butterworth-Heinemann, 2º vol. BRAS, A.; HENRIQUES F. (2012), Natural hydraulic lime based grouts - the selection of grout injection parameters for masonry consolidation, Construction and Building Materials Journal, 26:135-144 Higgins, D.D., (1981); Diagnosing the cause of defect or deterioration in concrete strucutres. British Standards Current Practice Sheet nº69, 33 pp. Henriques, F. et al (2005). Materiais Pétreos e Similares – Terminologia das formas de alteração e degradação. Laboratório Nacional de Engenharia Civil (LNEC), Lisboa Chawla, S., Materials selection for corrosion control. ISBN: 0-87170-474-9 McCauley, R., Corrosion of ceramics. ISBN: 0-8247-9448-6 Scott, G., Degradable polymers. ISBN: 0-412-59010-7
Observations	