



MINERALOGY AND PETROLOGY APPLIED TO CULTURAL HERITAGE

Enrollment year	2021/2022
Academic year	2021/2022
Regulations	DM270
Academic discipline	GEO/09 (MINERAL GEOLOGICAL RESOURCES AND MINERALOGIC AND PETROGRAPHIC APPLICATIONS FOR THE ENVIRONMENT AND CULTURAL HERITAGE)
Department	DEPARTMENT OF EARTH AND ENVIRONMENTAL SCIENCES
Course	GEOSCIENCES FOR SUSTAINABLE DEVELOPMENT
Curriculum	GEOSCIENZE APPLICATE ALLA GESTIONE DELL'AMBIENTE
Year of study	1°
Period	2nd semester (01/03/2022 - 10/06/2022)
ECTS	6
Lesson hours	48 lesson hours
Language	Italian
Activity type	ORAL TEST
Teacher	SETTI MASSIMO (titolare) - 6 ECTS
Prerequisites	The course requires students to have acquired the basic notions of the three-year degree in mineralogy and petrography. In particular the composition and classification of rocks, minerals, the main analytical methods used for mineralogical and petrographic analyzes, weathering processes, some petro-physical characteristics of the rocks (porosity and permeability).
Learning outcomes	Problems of preservation of architectural heritage, of the processes of decay that affect the different construction materials (stones, mortars, ceramics and bricks). Ability to identify and diagnose the causes of degradation, to recognize and classify the forms of degradation, perform the sampling of the degradation products on the various types of materials, to identify the analytical techniques necessary for the identification of the degradation products. Ability to draw up a technical

report which lists the causes of degradation, the different types of degradation products and any proposals for conservation work.

Course contents

The characteristics of the natural and artificial materials, the use of stone materials in monuments of great historical and architectural relevance and their present state of conservation. The rocks, the most important rock-forming minerals and their most relevant processes of transformation/alteration. The characterisation of the petrophysical properties of the rocks and their use as indicators of the degree of decay. The natural causes of the decay: humidity, rain, freeze-thaw cycle, temperature variation, wind, biological factors. The human-induced causes of the decay: atmospheric pollution, air composition in strong anthropic areas, the effects of acid rain and pollutants. The effects of the decay: loss of materials, fissuration, fracturation, crusts formation, salts, efflorescence, and others. The classification of the different forms of decay following the Normal recommendations. The sampling procedures, the invasive and non-invasive chemical-physical analyses. The methodologies for the diagnosis of the "pathologies" and for the interventions of restoration of lithoid materials, potteries, terra cotta, bricks and mortars: porosimetry, colour determination, optical microscopy, Scanning Electron Microscopy (SEM), X-Ray Powder Diffraction (XRPD), X-Ray Fluorescence (XRF). The techniques for the restoration of the materials: protection, cleaning, consolidation, substitution.

Teaching methods

The different topics of the course will be explained and discussed also considering some real examples of monuments or buildings of great historical and artistic importance. At the end of the course one or more guided excursions to visit some local monuments and relevant historical buildings are planned; during these tours the students will learn how to apply their theoretical knowledge by analysing the decay forms and by using the different sampling techniques.

Recommended or required readings

- Didactic materials provided by the teacher.
- Amoroso G.G. (2002). Trattato di scienza della conservazione dei monumenti. Alinea Editrice, Firenze.

Assessment methods

At the end of some chapters of the course we will organize a lecture in the form of debate, in which the essential points of the topics will be reconsidered. This lesson can be developed in two different modes:

- 1) the teacher discusses with students some real and very significant situations of preservation of cultural heritage;
- 2) Students will be invited to create independently some working groups and to identify, within their own experiences or personal interests, the issues related to the preservation of some monuments, archaeological sites, museums, worthy to be studied.

The active involvement of students will help to increase their interest and learning. Also it allows the teacher to regularly check their level of learning.

Oral exam

Further information

The teacher is available for further explanations and informations.

