



Master « Risks and Environment »
Educational field «Environmental Sciences and Engineering (SGE) »
M2 degree « MAterials of Cultural heritage in the Environment »

Simplified program 2019-2023

First semester	
Alteration environments Natural and polluted atmospheric environment (past, present, future). Buried environment. Biodeterioration agents. Indoor environment (monument and museum).	4 ECTS
Stone degradation and protection Mineralogical constituents. Chemical composition and physical structure of stone materials. Forms and mechanisms of alteration under the action of different agents: liquid water, salt, frost, atmospheric pollution.	4 ECTS
Glass degradation and protection Structure and properties of ancient and modern silicate glasses. Manufacturing processes. Intrinsic and extrinsic factors of alteration. Forms and mechanisms of alteration according to the environmental context (atmospheric, buried and aqueous environment).	3 ECTS
Metal degradation and protection Mechanisms and modeling of the alterations of various metals (iron base, copper base, aluminum base ...) in complex environments (soils, hydraulic binders and atmosphere). Very long-term corrosion of iron in these environments. Specific characterization techniques of the oxide layers.	3 ECTS
Concrete and wood degradation and protection Concrete and wood properties of in the environment. Restauration methods. Effects of these materials on the environment. Data necessary for life-cycle analysis.	3 ECTS
Diagnosis and data analysis Destructive and non-destructive methods and techniques used to diagnose in-situ or in the lab alterations. Processing of alteration data. Team diagnosis of a historical monument: field study and laboratory analyzes.	5 ECTS
International conference Participation to European conferences / workshops in English on the alteration of cultural heritage objects, non-destructive analytical developments and preservation methods. Networking with experts in alteration mechanisms. Lab and site visits with experts on the durability of heritage materials.	3 ECTS
Scientific English applied to cultural heritage Understanding of congress articles. Oral comprehension of online lectures. Verification of the pronunciation of the most common words used in heritage. Presentations on heritage themes. Revisions of grammatical points particularly useful for writing articles or project proposals.	3 ECTS
Internship search Professional approach, interview with laboratories and design offices. Problematisation and presentation of the chosen internship project (research or pro.)	2 ECTS
Second semester 5-month internship in a lab or a company Practical internship according to the offers distributed in the first semester by the MAPE jury or to the professional approach of the student. In the latter case, the offers are examined by the MAPE jury before validation, according to the adequacy with the MAPE's objectives.	30 ECTS