

4.00 credits

30.0 h

Q2

Teacher(s)	Demagnet Marc ;Sgambi Luca ;
Language :	French
Place of the course	Louvain-la-Neuve
Main themes	Any building is subject, during the period between its construction and demolition, to a series of actions (anthropic or environmental) that lead to a progressive degradation of its materials and a decrease in its resistance. The General Socio-Economic Survey (ESE 2001) allowed to highlight, through the elaboration of an indicator that evaluates the physical and structural condition of buildings, that about 13% of the Belgian constructions need at least a major repair. The objective of this course is to give an overview, as far as possible, of the problems related to the rehabilitation of buildings. In order to achieve this objective, the course will focus on the understanding of the resistance mechanisms of constructions, the analysis of the state of damage (level of damage and causes that generated it) and the definition of intervention methods capable of bringing the construction back to the level of safety required by the existing regulations.
Learning outcomes	At the end of this learning unit, the student is able to : • Identify the main pathologies associated with different structural materials (masonry, reinforced concrete, steel, wood); • Identify the main pathologies affecting bridges; • Mathematical modeling of certain pathologies to estimate the service life of a structure; • Understand the inspection and expertise process; • Define structural rehabilitation techniques.
Evaluation methods	The final assessment consists of an oral examination.
Teaching methods	Ex-cathedra teaching given by the teacher, combined with seminars (about 6 hours) given by practicing engineers or visiting professors.
Content	The course aims to present a series of topics that, due to lack of time, are not usually covered in classical courses on stability and design of buildings, such as: mechanical behavior of masonry, statics of masonry arches, analysis of cracks, characteristics of materials used for consolidation, mathematical models of the evolution of degradation, the most common methods and instruments of measurement in situ and in the laboratory, evaluation of the life cycle of a structure. As a tentative outline, the course will consist of 24 hours of ex-cathedra lectures covering both theoretical and computational aspects. These lectures will cover the following topics: Introduction to aspects of building pathology and rehabilitation. Static behavior of masonry. Structural pathologies in masonry constructions. Static behavior and pathologies of masonry arches. Physical and mathematical modeling of degradation in reinforced concrete and steel constructions. Laboratory measurements. Building materials for rehabilitation. Rehabilitation techniques for masonry constructions. Rehabilitation techniques for reinforced concrete constructions. Rehabilitation techniques for steel and wood constructions. Evaluation of the structural safety of deteriorated structures. Evaluation of the residual life of deteriorated structures. These lectures will be completed by approximately 6 hours of seminars given by practicing engineers or visiting professors.
Inline resources	Available on Moodle.

Bibliography	L'enseignant mettra les transparents et les supports de cours à disposition sur MOODLE. Les étudiants qui souhaitent approfondir le sujet du cours peuvent lire les livres suivants : Marco Andrea Pisani, Consolidamento delle strutture, Hoepli. Sisto Mastrodicasa, Dissesti statici delle strutture edilizie, Hoepli. Wojciech Radomski, Bridge Rehabilitation, Imperial College Press Kurtz, Jean-Paul, Les ouvrages de génie civil: Les Ouvrages d'Art Anciens. Jacques Fredet, Jean-Christophe Laurent, Guide du diagnostic des structures dans les bâtiments anciens, Le Moniteur. Tous les livres cités font partie de la bibliothèque personnelle de l'enseignant et peuvent être mis à la disposition des étudiants intéressés.
Faculty or entity in charge	GC

Programmes containing this learning unit (UE)				
Program title	Acronym	Credits	Prerequisite	Learning outcomes
Master [120] in Civil Engineering	GCE2M	4		