GHENT UNIVERSITY

Course Specifications

Valid as from the academic year 2018-2019

Sustainability of Materials (E065410)

Course size (nominal values; actual values may depend on programme)

Credits 4.0	Study time 120 h	Contact hrs	30.0 h

Course offerings and teaching methods in academic year 2018-2019

A (semester 2)	English	lecture	27.5 h
		excursion	2.5 h

Lecturers in academic year 2018-2019

De Belie, Nele	TW14	lecturer-in-charge
Verbeken, Kim	TW11	co-lecturer

Offered in the following programmes in 2018-2019	crdts	offering
Master of Science in Engineering: Architecture (main subject Architectural Design and Construction Techniques)	4	A
Master of Science in Electromechanical Engineering (main subject Control Engineering and Automation)	4	A
Master of Science in Electromechanical Engineering (main subject Electrical Power Engineering)	4	A
Master of Science in Electromechanical Engineering (main subject Maritime Engineering)	4	A
Master of Science in Electromechanical Engineering (main subject Mechanical Construction)	4	A
Master of Science in Electromechanical Engineering (main subject Mechanical Energy Engineering)	4	A
Master of Science in Engineering: Architecture (main subject Urban Design and Architecture)	4	A
Master of Science in Chemical Engineering	4	A
Master of Science in Sustainable Materials Engineering	4	A
Master of Science in Chemical Engineering	4	A
Exchange Programme Architecture	4	A

Teaching languages

English

Keywords

sustainability, durability, concrete, stone, metal, corrosion, thermal oxidation, wear, diagnosis, repair

Position of the course

Give the students insight into the most important causes of deterioration of stony materials and metals and into the different available techniques and measures to improve the durability of those materials. Provide information on techniques to judge the environmental impact of building materials and complete structures. This course contributes to the acquisition of following competences: have the attitude to develop and design in a durable and sustainable way; be able to use broadening information creatively.

Contents

- Concrete and stone: Durability of concrete, overview of the different types of interaction between concrete and the environment and how a suitable mix design can increase the service life, environmental impact of stony building materials and life cycle assessment.
- Metals: Introduction to LCA and sustainable use of metals. Overview of the different types of interactions between a metal and its environment and impact of this

interaction on the metal's life cycle. Overview on how an appropriate choice of material can extend the life span of a metal and discussion on different other ways on how one can influence this. Case studies. Structural materials for the hydrogen economy.

Initial competences

Knowledge of physics, chemistry and material science (level bachelor civil engineering).

Final competences

1 To know relevant concepts such as: concrete degradation, durability, biogenic sulphuric acid corrosion, alkali silica reaction, rebar corrosion, non-destructive testing, biodeterioration, bioreceptivity, bioconsolidation, repair methods, life cycle assessment, environmental declarations, corrosion mechanisms and types, interaction metal - environment, corrosion control, thermal oxidation, wear, hydrogen embrittlement.
2 Know the possible causes of concrete degradation and the tools to make a diagnosis.
3 Identify negative and positive effects of environmental conditions on stony materials.
4 Comprehend the different techniques to repair and protect concrete or stone.
5 Be aware of the environmental impact and sustainability of building materials and structures.
6 Realize the economical and ecological consequences of metal corrosion.
7 Be able to explain the causes of corrosion and methods for corrosion control when metals are used at high temperatures.
8 Be able to recognize a damage pattern in metal structures, propose a method for diagnosis and make a repair planning.

Conditions for credit contract

Access to this course unit via a credit contract is determined after successful competences assessment

Conditions for exam contract

This course unit cannot be taken via an exam contract

Teaching methods

Excursion, lecture

Learning materials and price

Course notes Partim concrete and stone (in English). Course notes Partim metals.

References

Alexander, M., Bertron, A., De Belie, N. (eds.). (2012). Performance of cement-based materials in aggressive aqueous environments. State-of-the-Art Report, RILEM TC 211 – PAE. Springer, 449 p., ISBN 978-94-007-5412-6.

Course content-related study coaching

Evaluation methods

end-of-term evaluation

Examination methods in case of periodic evaluation during the first examination period

Oral examination

Examination methods in case of periodic evaluation during the second examination period

Oral examination

Examination methods in case of permanent evaluation

Possibilities of retake in case of permanent evaluation

not applicable

Extra information on the examination methods

During examination period: oral closed-book exam, written preparation.

Calculation of the examination mark

The parts on concrete and stone, respectively metals, each account for 50% of the total.