

Course guide

240EM022 - 240EM022 - Control of Degradation and Corrosion

Last modified: 26/06/2025

Unit in charge: Barcelona East School of Engineering

Teaching unit: 702 - CEM - Department of Materials Science and Engineering.

Degree: ERASMUS MUNDUS MASTER'S DEGREE IN ADVANCED MATERIALS SCIENCE AND ENGINEERING (Syllabus 2014). (Optional subject).

Academic year: 2025

ECTS Credits: 4.5

Languages: Spanish

LECTURER

Coordinating lecturer: TERESA ANDREU ARBELLA

Others:

PRIOR SKILLS

Basic knowledge on physics, chemistry and mathematics.

DEGREE COMPETENCES TO WHICH THE SUBJECT CONTRIBUTES

Specific:

CEMCEM-05. (ENG) Realitzar inspeccions i control de qualitat de materials i els processos de producció, transformació i ús

CEMCEM-06. (ENG) Definir, desenvolupar i elaborar normatives i especificacions realitzats als materials i les seves aplicacions

CEMCEM-08. (ENG) Avaluar el temps de vida en servei, la reutilització, la recuperació i el reciclatge de productes atenent a les característiques dels materials que el conformen

Transversal:

02 SCS N2. SUSTAINABILITY AND SOCIAL COMMITMENT - Level 2. Applying sustainability criteria and professional codes of conduct in the design and assessment of technological solutions.

06 URI N2. EFFECTIVE USE OF INFORMATION RESOURCES - Level 2. Designing and executing a good strategy for advanced searches using specialized information resources, once the various parts of an academic document have been identified and bibliographical references provided. Choosing suitable information based on its relevance and quality.

TEACHING METHODOLOGY

Subject in process of extinction. There is no teaching, the students that enroll it do so only with the right to an exam.

LEARNING OBJECTIVES OF THE SUBJECT

The objective of the subject is that the student understands the main mechanisms of degradation and corrosion of materials and know how to choose the most appropriate material for each environment. At the end of the subject the student must be able to:

- Understand the thermodynamic and kinetic principles related to the corrosion of materials.
- Know the different types of corrosion, know the origin, the damages they cause and how to prevent them, according to the type of material.
- Understand the main mechanisms of degradation of materials
- Know the experimental tests for the control of corrosion and degradation
- Know how to apply theoretical knowledge to practical situations
- Be able to expand the knowledge acquired by consulting the bibliography.

STUDY LOAD

Type	Hours	Percentage
Hours small group	13,5	12.00
Hours large group	27,0	24.00
Self study	72,0	64.00

Total learning time: 112.5 h

CONTENTS

TYPES OF DEGRADATION

Description:

Electrochemical corrosion of metals.

Corrosion due to fatigue.

Phenomena of high temperature degradation of metals and ceramic materials. Physicochemical aging of plastics and polymer coatings.

Flammability of materials.

Biological corrosion or "biofouling".

Full-or-part-time: 13h 30m

Theory classes: 10h 30m

Laboratory classes: 3h

DEGRADATION ANALYSIS

Description:

Failure analysis of materials.

Laboratory tests of corrosion and degradation of materials.

Prediction of the useful life time.

Full-or-part-time: 9h

Theory classes: 6h

Laboratory classes: 3h

PROTECTIVE MEASURES

Description:

Cathodic protection.

Coatings and coatings.

Inhibitors of corrosion and degradation (additives).

Full-or-part-time: 9h

Theory classes: 7h 30m

Laboratory classes: 1h 30m



PRACTICAL CASES

Description:

Corrosion of steel in reinforced concrete.

Corrosion and degradation in chemical industry equipment.

Related activities:

Work of analysis of practical cases and recent scientific publications with oral presentation.

Full-or-part-time: 9h

Theory classes: 3h

Laboratory classes: 6h

GRADING SYSTEM

Subject in process of extinction. There is only one final test that corresponds to 100% of the final grade of the subject.

BIBLIOGRAPHY

Basic:

- Schweitzer, Philip A. Atmospheric degradation and corrosion control. New York [etc.]: Marcel Dekker, cop. 1999. ISBN 0824777093.
- Otero Huerta, Enrique. Corrosión y degradación de materiales. Madrid: Síntesis, DL 1997. ISBN 8477385181.
- Kutz, M. Handbook of environmental degradation of materials [on line]. Norwich, NY: William Andrew Publishing, 2005 [Consultation: 13/05/2020]. Available on: <https://www.sciencedirect.com/science/book/9780815515005>. ISBN 9780815515005.
- Revie, R.W., Uhlig, H.H. Uhlig's corrosion handbook [on line]. 3rd ed. Hoboken, N.J: Wiley-Interscience, 2011 [Consultation: 13/05/2020]. Available on: <https://onlinelibrary.wiley.com/doi/book/10.1002/9780470872864>. ISBN 9780470872864.

RESOURCES

Other resources:

In the digital campus of the subject, prior to the theory sessions, the visual support material used in class sessions will be placed.