

## Surface Engineering

Academic Year: ( 2023 / 2024 )

Review date: 18-04-2023

Department assigned to the subject: Materials Science and Engineering and Chemical Engineering Department

Coordinating teacher: BAUTISTA ARIJA, MARIA ASUNCION

Type: Electives ECTS Credits : 3.0

Year : 4 Semester :

## REQUIREMENTS (SUBJECTS THAT ARE ASSUMED TO BE KNOWN)

Technology of Materials

## OBJECTIVES

- Knowledge about the basic mechanism of surface deterioration: aqueous corrosion, corrosion in hot gases and wear.
- Ability to interpret the results of the most common corrosion and wear tests.
- Knowledge about the advantages and limitations of the techniques and technologies most used to protect the surfaces and improve their properties.

## DESCRIPTION OF CONTENTS: PROGRAMME

Surface Engineering Course 23/24

- Topic 1: Corrosion cells and importance of oxides
- Topic 2: Corrosion in hot gases
- Topic 3: Materials for corrosive conditions
- Topic 4: Thermodynamics of aqueous corrosion
- Topic 5: Generalized corrosion and distribution of anodes
- Topic 6: Localized corrosion and assisted by physical efforts
- Topic 7: Corrosion tests
- Topic 8: Aqueous corrosion evaluation methods
- Topic 9: Types of coatings
- Topic 10: Surface preparation
- Topic 11: Metallic coatings by immersion
- Topic 12: Metallic coatings by electrodeposition
- Topic 13: Metallic coatings by chemical deposition
- Topic 14: Conversion coatings
- Topic 15: Thermal Spray Coatings
- Topic 16: Deposition of thin layers: PVD and CVD

## LEARNING ACTIVITIES AND METHODOLOGY

Throughout the fourteen weeks of class, six evaluable exercises will be proposed that students must solve to delve into the content taught during the face-to-face sessions. Students will have 7 days to solve the exercises. These will be published in Aula Global immediately after the delivery of the following face-to-face sessions:

Students must attend two laboratory sessions, obtain the experimental data and complete the corresponding scripts in small groups. The laboratory sessions will have to arrive within the class schedule and on the following dates

- Session 12: April 23th
- Session 13 - April 30th

There will be three multiple choice questionnaires during the classes. The questionnaires will be face-to-face, in the classroom, at the beginning of the session.

Students may request by email all those tutorials (individual or in small groups) that they believe are necessary to properly assimilate the concepts taught in class.

## ASSESSMENT SYSTEM

- 10% laboratory practices (with resolution in small groups of the questions raised in the scripts).
- 20% 6 evaluable exercises (to be solved individually or in pairs). There will be 2 exercises per thematic block.
- 30% 3 multiple choice questionnaires carried out during the course and referring to three different thematic blocks.
- 40% final exam

Those students with more than 7 in one of the three blocks (60% mark of the questionnaire + 40% mark of the 2 exercises of the block) may choose to release that part of the final exam, keeping that grade for also 1/3 of the final evaluation.

Those students who, with the continuous assessment grade and two RELEASE parts of the final exam with a good grade and counting the other as 0 in the corresponding third of the final exam, achieve a pass can also release the subject.

<b>% end-of-term-examination:</b>	40
<b>% of continuous assessment (assignments, laboratory, practicals...):</b>	60

## BASIC BIBLIOGRAPHY

- E. Otero Huerta Corrosión y Degradación de Materiales, Sintesis.
- J.A Gonzalez Fernández Control de la corrosión. Estudio y medida por técnicas electroquímicas, CSIC.
- J.L. Puertolas y otros Tecnología de superficies de materiales, Sintesis.
- Varios Friction, lubrication and wear. ASM Handbook Vol. 18, ASM.

## ADDITIONAL BIBLIOGRAPHY

- A. Foresgren Corrosion control through organic coatings, CCR/Taylor and Francis.
- M.G. Fontana Corrosion engineering, McGraw-Hill international.
- R. Baboian Corrosion tests and standards: application and interpretation , ASM.
- R.A. Cottis Sheirs Corrosion, Elsevier.
- Varios Corrosion. ASM Handbook Vol. 13, ASM.