Surface Engineering

Academic Year: (2022 / 2023) **Review date: 23-05-2022**

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 electrochemical deterioration of surfaces: aqueous corrosion and corrosion in hot gases.
- Ability to interpret the results of the most common corrosion 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 22/23

Topic 1. Piles of corrosion and importance of the nature of the oxides.
Topic 2. Corrosion in hot gases
Topic 3. Thermodynamics of aqueous corrosion
Topic 4. Generalized corrosion and preferential distribution of anodes.
Topic 5. Localized corrosion assisted by physical efforts.
Topic 6. Materials for corrosive conditions
Topic 7. Tribology
Topic 8. Stress assisted corrosion
Topic 9. Corrosion determined by metallurgical factors
Topic 10. Aqueos corrosion testing
Topic 11. Types of coatings
Topic 12. Preparation of surfaces
Topic 13. Metallic coatings by immersion.
Topic 14. Electroplated metal coatings.
Topic 15. Metallic coatings by chemical deposition.
Topic 16. Coatings by conversion.
Topic 17. Thermal spraying.
Topic 18. 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:
- Exercise 1: session 2
- Exercise 2: session 4
- Exercise 3: session 7
- Exercise 4: session 9
- Exercise 5: session 10
- Exercise 6: session 13

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 11 ¿ April 18
- Session 12 - April 25

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:
The dates and contents of the questionnaires will be:
- Test 1: session 6, March 7 (items 1-5)
- Test 2: April 10 (issues 6-9)
- Test 3: May 16 (items 10-16)
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 6.5 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.

% end-of-term-examination:	40
% of continuous assessment (assigments, laboratory, practicals…):	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.