



DENOMINACIÓN ASIGNATURA: Electrochemical corrosion testing and materials characterization techniques

POSTGRADO: MÁSTER UNIVERSITARIO EN CIENCIA E INGENIERIA DE MATERIALES
Profesor/a: ANTONIA JIMENEZ-MORALES

ECTS: 3

CUATRIMESTRE: 2

TIMETABLE OF THE COURSE (detailed version)

WEEK	SESION	DESCRIPTION OF THE CONTENTS OF THE SESSION	GROUP (mark x)		Indicate different classroom space required (computer classroom, audiovisual, etc ..)	WORK OF THE STUDENT DURING THE WEEK		
			1	2		DESCRIPCION	ATTENDANCE HOURS	HOURS OF INDIVIDUAL WORK (maximum 7 ho a week)
1	1	<p>0. Presentation of the subject</p> <p>1. The aqueous corrosion and types Introduction of the course and basic description of the phenomenon of aqueous corrosion and different types</p> <p>2. Thermodynamics of aqueous corrosion Introduction of the parameters necessary to understand the thermodynamic parameters of aqueous corrosion</p>	x		Classroom with projector and blackboard	Critical reading of texts recommended by the teacher	1.5h	6h
1	2	<p>3. General corrosion. Mechanism and electrochemical study. Description of the electrochemical behavior of a system that corrodes in general way and of the non-destructive and destructive tests that can be used to characterize its corrosion performance.</p>	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended by the teacher	1.5h	4h



2	3	<p>4. Galvanic corrosion. Mechanism and electrochemical study. Go deep into the importance of the galvanic couples and the anode/cathode ratio. Behaviour of the galvanic couples in polarization curves.</p> <p>5. Localized corrosion. Types. Mechanisms and electrochemical study (part 1) Types of localized corrosion and full description of the mechanisms they are developed.</p>	x		Classroom with projector and blackboard	Solve exercises proposed by the teacher	1.5h	4h
2	4	<p>PRACTICE 1. Electrochemical tests current (PART I) Linear polarization of steel and brass. Steel polarization curve. Application of potential step in steel embedded in mortar.</p>	x		Lab 1.1A04	Critical reading of texts and paper recommended by the teacher Elaboration of works and reports group	1.5h	4h
3	5	<p>6. Localized corrosion. Types. Mechanisms and electrochemical study (part 2) Studies of the probability of onset of localized corrosion by polarization curves.</p> <p>7. Corrosion determined by metallurgical factors. Types Behavior against corrosion of biphasic materials. Factors that determine the sensitization of stainless steels and aluminum</p>	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended by the teacher	1.5h	4h
3	6	<p>8. Passivable systems and their electrochemical characterization Anodic polarization curves for passivable systems. Interest of the EPR-DL test to determine the sensitization of stainless steels.</p> <p>9. Methods of evaluation of the corrosion rate The different ways of evaluating the behaviour against the corrosion of a system: advantages and limitations. Exercises to pass information from one form to another.</p>	x			Critical reading of texts and paper recommended by the teacher Elaboration of works and reports group	1.5h	4h



4	7	<p>10. Accelerated tests in cameras Description of the operation, the handling and the possible problems that can arise in the accelerated tests in cameras. Extensive study of the most common cameras and trials.</p> <p>11. Accelerated tests in immersion Description of some common immersion tests to evaluate the corrosion behaviour of metals.</p> <p>12. Atmospheric corrosion tests Deepening the specific characteristics of atmospheric corrosion tests both in exterior and interior environments.</p>	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended by the teacher Elaboration of works and reports group	1.5h	4h
4	8	<p>PRACTICE 2. DC Electrochemical tests (PART II) Visit to the laboratory of climatic chambers. EPR sensitized stainless and receive state. Polarization curve of steel in Avesta. Visit the climatic chambers</p>	x		Lab 1.1A04	Critical reading of texts and paper recommended by the teacher Resolution by students of practical cases	1.5h	4h
5	9	<p>13. AC electrochemical techniques. Impedance Spectroscopy (EIS) Description AC electrochemical tests. Definition of electrochemical impedance spectroscopy (EIS)</p>	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended by the teacher Resolution by students of practical cases	1.5h	3h
5	10	<p>14. Electrochemical characterization of protective coatings with EIS Study by EIS and other electrochemical techniques protective coatings. Description of practical cases.</p>	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended by the teacher Elaboration of	1.5h	4h



						works and reports group		
6	11	15. Electrochemical characterization of iono-selective membranes, electrochemical sensors and biosensors Study by EIS and other electrochemical techniques such as membrane systems, sensores and biosensors. Description of practical cases	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended by the teacher Resolution by students of practical cases	1.5h	4h
6	12	PRACTICE 3. AC electrochemical tests on metals with and without protective coatings. Electrochemical tests in membranes and AC impedance spectroscopy sensors applied to the electrochemical characterization of membranes and sensors Electrochemical impedance spectroscopy of metal alloys and metal protected protective coatings	x		Lab 1.1A04	Critical reading of texts and paper recommended by the teacher Elaboration of works and reports group	1.5h	4h
7	13	PRACTICE 4. Adjustment of the impedance diagrams obtained in Practice 3. Use of the ZView program to determine the mechanism of load exchange in different systems (coatings and membranes)	x		Classroom with projector and blackboard	Reading of the scripts of practices and resolution in small groups of the questions raised in them based on the results obtained in the laboratory	1.5h	3h
7	14	16. Localized scanning techniques: SECM, SVET, LEIS Description of other advanced alternating current techniques. 17. Examples of the combination of global EIS + localized techniques in current cases	x		Classroom with projector and blackboard	Critical reading of texts and paper recommended	1.5h	3h



						by the teacher Resolution by students of practical cases		
		<i>exam</i>				<i>Preparation for the exam</i>	--	<i>3.5h</i>
TOTAL HOURS							21h	39 h theoretical + 12 h practices