

MATERIALS CORROSION AND PROTECTION

1.1. Identification

University:	Alma Mater Studiorum – Università di Bologna											
School:	School of Engineering											
Course:	Science and technology of composites materials											
ECTS:	6											
Semester:	<i>Winter</i>				X	<i>Summer</i>						
Category	<i>Fundamental course</i>				X	<i>Specialisation course</i>						
Module	<i>MFI</i>		<i>MFII</i>	X	<i>MFIII</i>		<i>MSI</i>		<i>MSII</i>		<i>MSIII</i>	
Teachers:	Maria Chiara Bignozzi											
Language:	<i>English</i>	X	<i>Italian</i>	X	<i>Swedish</i>		<i>Spanish</i>					

1.2. Learning-outcomes

- Knowledge of main corrosion processes of metals.
- Analysis of metals protection systems
- Knowledge of design parameters and choice criteria to avoid corrosion phenomena.

1.3. Competencies

▪ General

- to have critical understanding of technical and scientific tools
- communication skills
- to work in an international context

▪ Specific

- to understand the importance of corrosion phenomena.
- to understand corrosion causes and the available means for preventing or minimizing damage.
- to develop better choice criteria in metals design.

1.4. Contents

Morphology of corrosive phenomena, rate and penetration of corrosive attack, type of corrosion. Electrochemical corrosion. Thermodynamic: Nerst equation, corrosion tendency and electrode potentials, Pourbaix diagrams. Cinetic aspects: polarization and corrosion

rate, causes of polarization. Passivity. Effect of stress: stress corrosion cracking, corrosion fatigue, hydrogen cracking, etc. Localized corrosion: selective corrosion, pitting, etc. Thermal, chemical, mechanical treatments of metal surfaces and protection methods: metallic, inorganic and organic coatings. Inhibitors and passivators. Anodic and cathodic protection. Dry corrosion: thermodynamic and corrosion rate. High temperature strength materials. Corrosive environment and choice criteria for suitable materials.

1.5. Teaching Methodology

- Lecture sessions
- laboratory sessions

1.6. Evaluation

- oral evaluation

1.7. Bibliography

H. Uhlig – Corrosion and corrosion control: an introduction to corrosion science and engineering – John Wiley & Sons, Inc.