

Course: Corrosion and environment		
Language: English		
Lecturer: Helena Otmačić Ćurković		
TEACHING	WEEKLY	SEMESTER
Lectures	2	30
Laboratory	1	15
Seminar	-	
		Overall: 45
		ECTS: 4

PURPOSE: The aim of the course is to present corrosion processes, the mechanism and kinetic of corrosion reactions. The influence of corrosion of structural materials on environment and economy is examined. Corrosion protection methods are presented and a special emphasis is placed on those protection methods that pollute the environment. Possibilities for replacing various toxic substances and risky procedures with new non-toxic compounds and procedures that do not present hazard to environment are analyzed.

THE CONTENTS OF THE COURSE:

1. Types and causes of pollution.
2. Corrosion of metals: causes, theoretical background and types of corrosion processes. Dependence of corrosion rate and forms of corrosion damage on environment.
3. Effects of corrosion on environment: influence of corrosion products on environment (water, soil). Endangerment of human lives and environment by the corrosion of structural materials.
4. Importance of adequate corrosion protection and monitoring in various industries: chemical, food, pharmaceutical, oil and gas industry.
5. Corrosion in human body. Corrosion in nuclear power plants and canisters for nuclear waste storage. Corrosion stability of stainless steel in various environment
6. Presentation of student works. Discussion
7. Preliminary exam
8. Visiting industrial facilities related to the corrosion protection
9. Biocorrosion. Increased corrosion in polluted environments.
10. Corrosion protection methods that negatively influence to the ecological system: metal protection by treatment of corrosion medium; environmental compliance of corrosion inhibitors (problem of toxic inhibitors); design and investigation of new non-toxic corrosion inhibitors.

11. Electrochemical methods for corrosion protection: cathodic protection (problem of soluble anodes). Organic coatings (toxic additives to protective coatings; pigments of heavy metals, organic solvents).

12. Protective coatings: problems in surface preparation, metallic coatings (highly toxic electroplating baths);

13. The analysis of possibilities for replacing toxic methods by newly-developed environmentally acceptable corrosion protection methods and practices

14. Presentation of student works. Discussion

15. Preliminary exam

GENERAL AND SPECIFIC COMPETENCE: -Understanding of hazards that corrosion and inadequate corrosion protection present to environment and human health;

- Recognizing how some of the corrosion protection methods may endanger environment and human health due to the release of toxic compounds;

- Ability to determine which corrosion protection method is the most adequate for given corrosion issue;

- Relating presence of pollution and climatic parameters to the corrosion level of various structural materials.

KNOWLEDGE TESTING AND EVALUATION:

Preliminary exam. Oral presentation of seminar papers. Written exams.

MONITORING OF THE COURSE QUALITY AND SUCCESSFULNESS:

Continuous evaluation.

LITERATURE:

1. S.K. Sharma: Green Corrosion Chemistry and Engineering, Wiley-VCH, Germany, 2012.

2. Helena Otmačić Čurković, Lecture notes, www.fkit.unizg.hr, 2014