Course Name						
PRINCIPLES OF CORROSION AND CORROSION PROTECTION						
Code	**Semester**	**Local Credits**	**ECTS Credits**	**Course Implementation, Hours/Week**		
				Theoretical	**Tutorial**	**Laboratory**
MET 437E	7	2	3	2	-	-

Department/Program	Metallurgical and Materials Engineering			
Course Type	Required		**Course Language**	English
Course Prerequisites	None			
Course Category by Content, %	**Basic Sciences**	**Engineering Science**	**Engineering Design**	**General Education**
		% 30	% 70	

Course Description

Definition and significance of corrosion. Classification of corrosion. Thermodynamic and kinetic principles of electrochemical corrosion. Passivity. Forms of corrosion:- uniform corrosion, pitting, crevice, galvanic corrosion, environmentally induced cracking, corrosion types induced by the flow velocity of the environment, effects of metallurgical structure on corrosion, corrosion related damages by hydrogen, erosion and wear. Corrosive environments: - atmosphere, soil, water and aqueous environments, concrete, high temperature environments. Principles of corrosion protection:- design, change of metal, change of environment, change of interface. Inorganic, metallic and conversion coatings. Organic coatings and inhibitors.- cathodic and anodic protection. Principles of materials selection for corrosion protection

Course Objectives

After completing this course the student will be able to:

1. Know the importance and interdisciplinary character of corrosion
2. To apply basic corrosion knowledge to engineering problems
3. Understand material-environment and corrosion type relation
4. Understand the necessity of learning basic principles of corrosion and corrosion protection for material selection and application
5. Analyse and bring viable engineering solutions to actual corrosion and corrosion protection problems

Course Learning Outcomes

1. Student will learn the effect of the environment in which materials are designed and produced to function, the importance of theoretical knowledge in devising practical solutions to corrosion problems and of material protection for health, security, engineering and environmental reasons.
2. The student will be able to analyse various corrosion related engineering failure problems, to explain them and suggest engineering solutions.
3. He will learn to cooperate with other people to attack and solve problem and will also learn how to present his solution.

Ders Kitabı (Textbook)

- D. A. Jones, Principles and Prevention of Corrosion, Macmillan Pub. N.York, 1992. ISBN 0-02-946439-0

Other References

- L.L. Shreir, R.A. Jarman and G. Burstein (eds), Corrosion Vol.1,2 and 3 (3th Edition) Butter Worth-Heineman, 1994.
- K. R. Trethewey and J. Chamberlain, Corrosion for Science and Engineering (2nd edition), Longman Scientific and Technical, Longman Group Technical, Essex, England, 1995

Homework & Projects

Laboratory Work

Computer Use

Other Activities

Assessment Criteria		**Quantity**	**Effects on Grading, %**
	Activities	**-**	**-**
	Midterm Exams	**MIN 1**	**% 40**
	Quizzes	**MIN 2**	**% 10**
	Homework	**-**	**-**
	Projects	**-**	**-**
	Term Paper/Project	**-**	**-**
	Laboratory Work	**-**	**-**
	Other Activities	**-**	**-**
	Final Exam	**1**	**% 50**

COURSE PLAN

Weeks	Topics	Course Outcomes
1	Definition , significance and basic principles of corrosion.	1,3
2	Classification of corrosion	2
3	Thermodynamic principles of electrochemical corrosion.	2
4	Electrochemical kinetics of corrosion	2
5	Passivity and breakdown of passivity.	2
6	Forms of corrosion:- Uniform corrosion, localized corrosion; galvanic corrosion and concentration cell corrosion	1,2
7	Forms of corrosion: Pitting, and crevice corrosion, environmentally induced cracking	1,2
8	Forms of corrosion: Effects of metallurgical structure on corrosion. Corrosion related damages by hydrogen, erosion and wear.	1,2
9	Corrosion in selected corrosive environments:- atmosphere, soil water and aqueous environments	1,2
10	Microbiologically induced corrosion, concrete corrosion High temperature environments	2,3
11	Principles of corrosion protection: - design, change of metal, change of environment, change of interface	2
12	Corrosion protection: - inorganic, metallic and conversion coatings	2
13	Corrosion protection: - organic coatings and inhibitors, cathodic and anodic protection.	2
14	Principles of materials selection for corrosion protection	2,3

Relationship between the Course and METALLURGICAL AND MATERIALS ENGINEERING **Curriculum**

	Program Outcomes	Level of Contribution		
		1	**2**	**3**
1	Ability to apply the knowledge of mathematics, science and engineering principles to solve problems in metallurgical and materials engineering (ABET:a)			X
2	Ability to characterize materials using standard and/or self designed experimental methods and to evaluate the results (ABET:b)	X		
3	Ability to design a system or a process, taking into consideration of the desired specifications, quality, ethics and environment. (ABET:c)		X	
4	Ability to communicate both orally and in the written form and to take part in, and provide leadership of the teams in the elucidation of engineering problems; (ABET:d, g)			
5	Ability to define, formulate and solve engineering problems in the development, production, processing, protection and usage of engineering materials. (ABET:e)			X
6	An understanding of professional and ethical responsibilities(ABET:f)			
7	An understanding of current/contemporary issues and impact of engineering solutions in broad cultural, national and global levels;. (ABET:h, j)	X		
8	A comprehension of the nature of engineering progress closely linked with the development of new materials and production processes. An ability to engage in life-long learning and a recognition of its necessity (ABET:i)		X	
9	Ability to use essential tools and techniques of modern engineering in the development, production, processing, protecting of the existing and new engineering materials. (ABET:k)			X

1: Little, 2. Partial, 3. Full

Course relationships with major elements of the field and material classes

		Level of Contribution		
		1	**2**	**3**
MAJOR ELEMENT OF THE FIELDS	**STRUCTURE**			x
	PROPERTIES			**x**
	DESIGN EXPERIMENT/ANALYSE DATA			
	PROCESSING	x		
	COST/PERFORMANCE	x		
	QUALITY/ENVIRONMENT	x		
	DESIGN PROCESS OR PRODUCT			x
MATERIAL CLASSES	**METAL**			x
	CERAMICS			
	POLYMERS			
	COMPOSITES	x		

1: Little, 2. Partial, 3. Full

Prepared by	**Date**	**Signature**
Prof. Dr. Mustafa Ürgen Asst. Prof. Dr. Cem Örnek	December 2020	