GUJARAT TECHNOLOGICAL UNIVERSITY

METALLURGY ENGINEERING (21)
INDUSTRIAL CORROSION, TESTING, PREVENTION & CONTROL
SUBJECT CODE: 2182112
B.E. 8th SEMESTER

Type of course: Engineering

Prerequisite: Fundamentals of Corrosion.

Rationale: Corrosion of metal is a common problem across many industries like power, petrochemical, ship building and marine and fertilizer. Corrosion is often responsible for significant shutdown and maintenance costs. Shutdowns are costly in terms of productivity losses, restart energy, and material costs. Additionally, internal corrosion failures result in contamination of products and process streams, and external corrosion leaks create undesirable safety, personnel, and environmental hazards. These shortcomings could be reduced by improving the capability for engineers to better predict corrosion of alloys in many different conditions.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks						Total Marks
				Theory Marks			Practical Marks			
L	T	P	C	ESE (E)	PA (M)		ESE (V)		PA (I)	
					PA	ALA	ESE	OEP		
4	0	2	6	70	20	10	20	10	20	150

Content:

Sr. No.	Content	Total Hrs	% Weightage
1	Introduction and importance, forms of corrosion, and prevention of corrosion	**06**	**06**
2	Corrosion & its control in Power industries: Introduction, frequent forms of corrosion, environment, case studies, corrosion resistance materials.	**12**	**20**
3	Corrosion & its control in petrochemical industries: Introduction, frequent forms of corrosion, environment, case studies, corrosion resistance materials.	**12**	**20**
4	Corrosion & its control in ship building and marine industries: Introduction, frequent forms of corrosion, environment, case studies, corrosion resistance materials.	**10**	**18**
5	Corrosion & its control in fertilizer industries: Introduction, frequent forms of corrosion, environment, case studies, corrosion resistance materials.	**10**	**18**
6	Corrosion & its control in Automobile industries: Introduction, frequent forms of corrosion, environment, case studies, corrosion resistance materials.	**10**	**18**
	Total	60	100

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**25**	**45**	**10**	**10**	**00**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Surface Engineering for Corrosion and Wear Resistance. J. R. Davis
2. Handbook of Materials Failure Analysis with Case Studies from the Oil and Gas Industries ASH Makhlof and Mahmood Aliofkhazraei, Elsevier Ltd
3. ASM Handbook, Volume 13A Corrosion: Fundamentals, Testing, and Protection
4. Corrosion in Power Industry, Maroš Halama and Jan Stoulil, Trans Tech Publication
5. CORROSION FAILURES Theory, Case Studies, and Solutions K. ELAYAPERUMAL, V.S. RAJA John Wiley & Sons, Inc., Hoboken, New Jersey
6. Corrosion Engineering: Principles and Practice Pierre R. Roberge, MacGraw Hill
7. Corrosion of Constructional Steels in Marine and Industrial Environment, Saha, Jayanta Kumar, Springer
8. Corrosion in Fertilizer Equipment, Corrosion of Metals by Liquid Mixed Fertilizers J. D. Hatfield, A. V. Slack, G. L. Crow, H. B. ShafferJr., J. Agric. Food Chem
9. Materials Engineering for the Chemical Process Industries Prof.dr.ir. Walter BOGAERTS, Materials Technology Institute
10. Corrosion in the Petrochemical Industry, 2nd Edition ASM International
11. http://www.corrosion-doctors.org/Modules/mod-industries.htm

Course Outcome:

After learning the course the students should be able to:

-Understand causes of corrosion failure in different industries and suggest suitable methods to minimize it.

-Understand the importance & role of surface modifications to achieve several technological properties.

List of Experiments:

Case studies based on different unit of syllabus.

Major Equipment: Set up for performing Phosphating Process, Set up for Performing Anodizing Process, electrolytic tank , Modified Vertical milling machine for FSP etc.

List of Open Source Software/learning website:

1. www.nptel.iitm.ac.in
2. www.ocw.mit.edu
3. www.corrosion-doctors.org

ACTIVE LEARNING ASSIGNMENTS: Preparation of power-point slides, which include videos, animations, pictures, graphics for better understanding theory and practical work – The faculty will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the web-site of the College/ Institute, along with the names of the students of the group, the name of the faculty, Department and College on the first slide. The best three works should be submitted to GTU.