VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

ACCREDITED BY NAAC WITH A^{++} GRADE

DEPARTMENT OF CHEMISTRY

B.E. III SEMESTER

Open Elective: CORROSION AND ITS PREVENTION

Instruction : 2 Hrs / Week	SEE- Marks : 60	Course Code	: U22OE320CH
Credits : 2	CIE- Marks : 40	SEE- Duration	: 3Hours

OURSE OBJECTIVES	**COURSE OUTCOMES:**
The course will enable the students to:	**At the end of the course students should be able to:**
1. Acquaint with the causes and factors influencing the rate of corrosion 2. Understand the different types of corrosion like dry, wet and galvanic corrosion and their relative impact 3. Familiarize with various preventive methods of corrosion such as cathodic protection, use of inhibitors, coatings, etc. 4. Familiarize with industrial coating methods like electroplating, electrolessplating.	1. Explain different types of corrosion and factors that affect corrosion and passivation of metals. 2. Select a suitable metallic coating, organic coating and inhibitors for corrosion control of the equipment in a given application. 3. Discuss the principles and applications of cathodic protection and surface conversion coatings for corrosion control. 4. Apply the knowledge of various methods of corrosion control to suggest a solution for corrosion control of a given equipment in a given industrial application.

CO-PO MAPPING FOR CORROSION AND ITS PREVENTION

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO 8	PO9	PO10	PO11	PO12
1	3	1	-	-	-	-	-	-	-	-	-	1
2	3	1	1	-	-	-	-	-	-	-	-	1
3	3	2	1	-	-	-	-	-	-	-	-	2
4	3	2	1	-	-	-	-	-	-	-	-	2

UNIT-I: CHEMICAL AND ELECTROCHEMICAL CORROSION

Introduction - gravity, cause, chemical and electrochemical corrosion, Pilling – Bed worth rule, effect of nature of oxide layer on rate of chemical corrosion. Galvanic corrosion, electrochemical series and galvanic series. Formation of anodic and cathodic areas, Differential aeration corrosion -pitting, waterline corrosion, crevice corrosion, stress corrosion andcorrosion fatigue. Passivation of metals, polarization curve of passivating metals, effect of pH and potential for iron (pourbaix diagram) and the polarization curve of iron.

Factors influencing corrosion

a. Nature of metal: Relative position of metal in galvanic series, over voltage, relative areas of anode and cathode and nature of corrosion product.

b. Nature of environment: Temperature, pH, humidity and dissolved oxygen.

UNIT-II: CORROSION CONTROL BY METALLIC COATINGS

Metallic coatings: Types - anodic and cathodic. Pre treatment of surface of base metal. Methods of application of metallic coatings: Hot dipping- galvanization - applications of galvanized RCC steel bars. Cladding, electro plating and electroless plating- Principle and their differences. Electroplating of Cu and Cr on Fe, electroless plating of Ni and Cu on insulators, Preparation of printed circuit board (PCB) by electrolessplating.

UNIT-III: CORROSION CONTROL BY ORGANIC COATINGS AND INHIBITORS

Organic Coatings: Paints – constituents and their functions. Vitreous enamel coatings. Varnishes. Super hydrophobic and self healing coatings. Epoxy coatings on RCC steel bars- impervious coatings.

Corrosion inhibitors: Anodic, cathodic and vapour phase inhibitors.

UNIT-IV: CORROSION CONTROL BY CATHODIC PROTECTION AND SURFACE MODIFICATION

Cathodic protection: Principle, sacrificial anodic protection (SAP), impressed current cathodic protection (ICCP). Application of cathodic protection for bridges, ship hulls and underground pipelines.

Surface conversion coatings: Carburizing, nitriding, cyaniding.

Books:

1. P. C. Jain and Monica Jain, "Engineering Chemistry", Dhanpat Rai Pub, Co., New Delhi (2002)
2. S. S. Dara "A text book of engineering chemistry" S. Chand and Co. Ltd., New Delhi (2006).
3. Shasi Chawla, "Text Book of Engineering Chemistry", Dhanpat Rai Publishing Company, New Delhi (2008).
4. Wiley Engineering chemistry, Wiley India pvt Ltd, II edition.
5. Chemistry in engineering and technology by J. C. Kuriacose and Rajaram.

Suggested Reading:

1. Principles and prevention of corrosion: Denny A. Jones, Prentice Hall, 1996.
2. Derek Pletcher and Frank C. Walsh, "Industrial Electrochemistry", Chapman and Hall, New York, 1993
3. Fundamentals of Corrosion: Michael Henthorne, Chemical Engineering
4. Corrosion Engineering: Mars G Fontana, Mc Graw Hill, 1987

CIE: 40 Marks	
Average of 2 Internals	: 30 Marks each
Average of 2 Assignments	: 5 Marks each
Average of 2 Quizzes	: 5 Marks each