From the Academic Year 2018-2019

VASAVI COLLEGE OF ENGINEERING (A)

DEPARTMENT OF CHEMISTRY

B.E. IV SEMESTER

Open Elective: CORROSION SCIENCE AND TECHNOLOGY

Instruction	: 2Hrs / Week	SEE- Marks	: 60	Course Code	: OE440CH
Credits	: 2	CIE- Marks	: 40	SEE- Duration	: 3Hours

OBJECTIVES	OUTCOMES
The course will enable the students :	**At the end of the course students should be able to:**
1. To acquaint with the causes and factors influencing the rate of corrosion 2. To understand the different types of corrosion like dry, wet and galvanic corrosion and their relative impact 3. To familiarize with various preventive methods of corrosion such as cathodic protection, use of inhibitors, coatings, etc. 4. To know various industrial methods like electroplating, electroless plating.	1.Explain different types of corrosion with suitable examples 2. Analyze the given case study and diagnose the type of corrosion in a given corrosion problem 3.Discuss different factors that affect corrosion and passivation of metals 4. Select a suitable metallic coating for corrosion control of the equipment in a given application 5. Explain the mechanism by which organic coatings and inhibitors control corrosion of metals 6.Discuss the principles and application of cathodic protection and surface conversion coatings for corrosion control 7.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 8. Evaluate different corrosion control strategies in order to suggest a suitable strategy for corrosion control in a given application

UNIT-I: Chemical and Electrochemical Corrosion

Introduction - gravity, **cause, C**hemical 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, water line corrosion & crevice corrosion, stress corrosion, corrosion fatigue. Passivation of metals, polarization curve of passivating metals, effect of pH and potential-pH diagram for iron and polarization curve of iron.

Factors influencing corrosion

a. Nature of metal: Relative position of metal in galvanic series, Over voltage, Relative areas of anode & cathode and Nature of corrosion product.

b. Nature of environment: Temperature, pH and Humidity.

UNIT-II: Corrosion Control by Metallic Coatings

Metallic coatings: Types - anodic & 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 & Electroless plating- Principle and their differences. Electroplating of Cu coating on Fe, Electroless plating of Ni coating on Insulators, Preparation of PCB using Electroless plating.

UNIT-III: Corrosion Control by Inhibitors and Organic Coatings

Corrosion Inhibitors: Anodic, Cathodic and Vapour phase 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.

UNIT-IV: Corrosion Control by Cathodic Protection and Surface Conversion

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&Co.Ltd., New Delhi (2006).
3. Chemistry of Engineering Meterials by R.P Mani and K.N.Mishra, CENGAGE learning
4. Shasi Chawla, “Text Book of Engineering Chemistry”, Dhanpat Rai Publishing Company, NewDelhi (2008).

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