**From the Academic Year 2025-2026**

# VASAVI COLLEGE OF ENGINEERING (AUTONOMOUS)

*ACCREDITED BY NAAC WITH A++ GRADE*

**DEPARTMENT OF CHEMISTRY**

## B E III SEMESTER
## Open Elective: CORROSION SCIENCE AND TECHNOLOGY

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| Instruction : 2 H/ Week | Semester End Exam Marks : 60 | Subject Reference Code : OE310CH |
| Credits : 2 | Continuous Internal Exam Marks : 40 | Duration of semester End Exam : 3 Hours |

| 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 of corrosion and different types of corrosion.<br>2. To understand the factors influencing corrosion and Controlling Corrosion by Inhibitors and Organic Coatings.<br>3. To know different corrosion control coatings like electroplating and electrolessplating.<br>4. To familiarize with various preventive methods of corrosion such as cathodic protection and surface conversion. | 1. Explain different types of corrosion with suitable examples.<br>2. Discuss different factors that affect corrosion and protection by organic coatings and inhibitors.<br>3. Select a suitable metallic coating for corrosion control<br>4. Discuss the principles and application of cathodic protection and surface conversion coatings for corrosion control. |

| **CO-PO MAPPING FOR CORROSION SCIENCE AND TECHNOLOGY** | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| 1 | 2 | 1 | - | - | - | - | 1 | - | - | - | - | 1 |
| 2 | 2 | 1 | - | - | - | - | 1 | - | - | - | - | 1 |
| 3 | 2 | 1 | - | - | - | - | 1 | - | - | - | - | 1 |
| 4 | 2 | 1 | - | - | - | - | 1 | - | - | - | - | 2 |

## UNIT-I: CHEMICAL AND ELECTROCHEMICAL CORROSION

Introduction - gravity, cause**,** Chemical and Electrochemical corrosion - Mechanism, Pilling – Bed worth rule, effect of nature of oxide layer on rate of chemical corrosion, electrochemical series and galvanic series. Formation of anodic and cathodic areas, Galvanic corrosion, Differential aeration corrosion -pitting, water line corrosion & crevice corrosion, stress corrosion, corrosion fatigue.

## UNIT-II: CORROSION CONTROL METHODS

### *INHIBITORS AND ORGANIC COATINGS*

### *A. Factors influencing corrosion*

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

Nature of environment: temperature, pH and humidity.

### *B. Corrosion Control by Inhibitors and Organic Coatings*

Corrosion Inhibitors: Anodic, Cathodic and vapor phase inhibitors.

Organic Coatings: Paints – constituents and their functions, vitreous enamel coatings, varnishes and lacquers.

## UNIT-III: METALLIC COATINGS

Passivation of metals, polarization curve of passivating metals, effect of pH and potential-pH diagram for iron (Pourbaix Diagram) and polarization curve of iron, application of Pourbaix diagram for corrosion mitigation.

Metallic coatings: Types - anodic & cathodic. Surface pre-treatment 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-IV: 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. O.G. PALANNA, Engineering Chemistry, TMH Edition.

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