


BMS COLLEGE OF ENGINEERING, BENGALURU-19
 Autonomous Institute, Affiliated to VTU

INSTITUTIONAL ELECTIVE OFFERED BY THE DEPARTMENT OF CHEMISTRY

Course Name	Corrosion Science & Engineering	Course Code	17CY8IECSE
Credits	03	L-T-P-S	3- 0 -0-0
Contact hours	40	Faculty Handling	Dr.Kalyan Raj

Course Objectives

- Study of corrosion principles and their role in understanding different types of corrosion problems
- To gain the knowledge of types of corrosion in applying corrosive techniques to protect faster corrosion and monitoring of corrosion.
- Study of corrosion and different forms of corrosion to understand the failure of metal structures.
- Explore the different corrosion testing methods to measure the corrosion rate.
- To understand various techniques involved in design rules, coatings and other techniques in corrosion control.

CO. NO	COURSE OUTCOMES
	At the end of the course the student will have
CO 1	An ability to understand and Explain corrosion principles and various forms of corrosion and its monitoring and corrosion control
CO 2	An Ability to apply the learnt knowledge in testing, monitoring and control of various forms of corrosion
CO 3	An ability to develop methods of science and engineering in testing, monitoring and control of various forms of corrosion

SYLLABUS:

Unit – I. Corrosion Principles

Introduction, definition, environment. Corrosion damage. Classification, electrochemical reactions. Polarization passivity. Faradays laws of electrolysis, application, and problems. Thermodynamics: Free energy change. Electrode potentials, e.m.f Nernst equation. Environmental effects. Effect of O₂, oxidizer, velocity, temperature. Corrosion concentration, galvanic coupling. Metallurgical aspects. Numericals. **8hrs**

Unit – II. Types of corrosion-1

Uniform attack, galvanic corrosion, definition, Galvanic series, environmental effects, distance and area effect. Prevention, crevice corrosion, definition, environmental effects, mechanism. Filiform corrosion, mechanism, prevention, definition, environmental effects. Pitting corrosion, mechanism, prevention, definition, environmental effects. Solution composition, velocity, evaluation of damage, prevention. Inter

granular corrosion, definition, austenite SS. Weld decay. Control for austenite SS, knife line attack. Selective leaching. Dezincification. Type's mechanism, prevention. **8hrs**

Unit – III. Types of corrosion-2

Erosion corrosion: definition, effect of surface film Velocity of environment, impingement, galvanic effect control of erosion corrosion. Cavitation damage. Fretting corrosion. Wear-oxidation and oxidation – wear mechanisms. Corrosion fatigue, definition, environmental factors, mechanism. Hydrogen damage, prevention, classification. Bio and soil corrosion. **8hrs**

Unit – IV

Corrosion testing and monitoring: Introduction, classification. Purpose of corrosion testing, materials, specimen. Surface preparation, measuring and weighing. Types of testing, lab, pilot plant and field tests. Measurement of corrosion rate, weight loss method. Electrochemical methods, Tafel extrapolation. Linear polarization method, cleaning specimen after exposure. Effect of temperature, std. expression for corrosion rate. Application, numericals. **8hrs**

Unit – V. Corrosion control

Selection of materials, alteration of environment, temperature. Medium, velocity, removal of oxygen. Design, wall thickness, design rules. Cathodic protection, principles, procedure. Anodic protection, principle procedure, comparison. Metallic and other inorganic coatings, Cladding, vapour phase deposition, diffusion, chemical conversion coating. Surface modification, organic coating. Corrosion inhibitors. **8hrs**

Text Books:

1. M.G. Fontana, Corrosion Engineering, Tata McGraw-Hill Edition 2005

Reference Books:

1. Engineering Chemistry by B.K.Sharma. Edition: 6th Edition, 2011. Publisher: Krishna Prakashana Media (p) Ltd.
2. Electrochemistry and corrosion science, Nestor Perez, Springer (India) pvt.Ltd. 2004
3. Principles and prevention of corrosion, D.A.Jones, Macmillan Publ.Co. (1996)
4. Corrosion Handbook, Electrochemical society series. John Wiley and sons. (2000)

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