

Degradation of Materials (3-0-0) Credits: 03

Module I (14 Hours)

Technological importance of corrosion study, corrosion as non equilibrium process, corrosion rate expressions, electrochemical principles of corrosion-cell analogy, concept of single electrode potential, reference electrodes, e.m.f. and galvanic series-their uses in corrosion studies, polarization, passivity.

Different forms of corrosion-uniform attack, galvanic, crevice, pitting, intergranular, selective leaching, erosion, stress corrosion cracking-their characteristic features, causes and remedial measures.

Module II (12 Hours)

Principles of corrosion prevention-material selection, control of environment including inhibitors, cathodic and anodic protection, coatings and design considerations. Corrosion testing methods.

Introduction to high temperature corrosion, Pilling-Bedworth ratio, oxidation kinetics, oxide defect structures, Wagner-Hauffe valence approach in alloy oxidation, catastrophic oxidation, internal oxidation.

Module III (12 Hours)

Considerations in high temperature alloy design, prevention of high temperature corrosion -use of coatings.

Liquid metal attack - liquid metal embrittlement, preventive measures.

Chemical degradation of non-metallic materials like rubbers, plastics, ceramics etc.

Hydrogen damage - types, characteristics, mechanism and preventive measures.

Books for reference:

1. Fontana, M.G., Corrosion Engineering, McGraw-Hill.
2. Uhlig H.H., Corrosion & Corrosion control, John Wiley & Sons.
3. Evans, Introduction to Metallic Corrosion.
4. Glasstone S., Introduction to Electrochemistry.
5. Banerjee S.N., An Introduction to Science of Corrosion & its Inhibition, Oxonian Press Pvt. Ltd.