

UCH841: CORROSION ENGINEERING

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Course Objectives:

To provide an understanding of the corrosion principles and engineering methods used to minimize and prevent the corrosion.

Basic concepts: Definition and importance, Electrochemical nature and forms of corrosion, Corrosion rate and its determination.

Electrochemical thermodynamics and kinetics: Electrode potentials, Potential-pH (Pourbiax) diagrams, Reference electrodes and experimental measurements, Faraday's laws, Instrumentation and experimental procedure.

Galvanic and concentration cell corrosion: Basic concepts, Experimental measurements, and determination of rates of galvanic corrosion, Concentration cells.

Corrosion measurement through polarization techniques: Tafel extrapolation plots, Polarization resistance method, Commercial corrosion probes, Other methods of determining polarization curves.

Passivity: Basic concepts of passivity, Properties of passive films, Experimental measurement, Applications of Potentiostatic Anodic Polarization, Anodic protection.

Pitting and crevice corrosion: Mechanisms of pitting and crevice corrosion, Secondary forms of crevice corrosion, Localized pitting, Metallurgical features and corrosion: Intergranular corrosion, Weldment corrosion, De-alloying and dezincification.

Environmental induced cracking: Stress corrosion cracking, Corrosion fatigue cracking, Hydrogen induced cracking, Methods of prevention and testing, Erosion, Fretting and Wear.

Environmental factors and corrosion: Corrosion in water and aqueous solutions, Corrosion in sulphur bearing solutions, Microbiologically induced corrosion, Corrosion in acidic and alkaline process streams.

Atmospheric and elevated temperature corrosion: Atmospheric corrosion and its prevention, Oxidation at elevated temperatures, Alloying, Oxidizing environments.

Prevention and control of corrosion: Cathodic protection, Coatings and inhibitors, Material selection and design.

Course Learning Outcomes (CLO):

The students will be able to:

1. solve problems involving various types of corrosion.
2. select corrosion resistant materials for a given application.

3. select technique for corrosion prevention.

Text Books:

1. Fontana, M.G., *Corrosion Engineering*, Tata McGraw-Hill (2008). 3rd ed. (seventh reprint)
2. Jones, D.A., *Principles and Prevention of Corrosion*, Prentice-Hall (1996).

Reference Books:

1. Pierre R. Roberge, *Corrosion engineering: principles and practice*, McGraw-Hill (2008).
2. Pierre R. Roberge, *Handbook of corrosion engineering*, McGraw-Hill (2012). 2nd ed.
3. Sastri, V.S., Ghali, E. and Elboudjaini, M., *Corrosion prevention and protection: Practical solutions*, John Wiley and Sons (2007).

Evaluation Scheme:

S. No.	Evaluation Elements	Weightage (%)
1	MST	30
2	EST	50
3	Sessional (may includes assignments/ quiz's etc)	20