

## Corrosion Engineering

1.1 Course Number: CH202

1.2 Contact Hours: 2-0-0 Credits: 06

1.3 Semester: 3<sup>rd</sup> year- even

1.4 Prerequisite: Materials Science, Thermodynamics and Kinetics, Mass Transfer

1.5 Syllabus Committee Member: Dr Deepak Dwivedi, Prof. Amit Ranjan

2. **Objective:** The objective of this course is to enable the students to understand the industrial corrosion scenarios and to develop understanding on microscopic and electrochemical origins of the corrosion phenomena. This course will also help students to understand the factors responsible for industrial corrosion and to design corrosion mitigation strategies by using appropriate engineering methods.

### 3. Course Content:

Unit wise distribution of content and number of lectures

Unit	Topics	Sub-topic	Lectures
1	Introduction and Corrosion Principles	General Introduction, corrosion rate expression, electrochemical reactions, polarization, passivity	3
2	Types of Corrosion	Galvanic (two-metal corrosion), Pitting, selective leaching, crevice corrosion, stress corrosion, hydrogen damage, erosion corrosion, intergranular corrosion, microbial corrosion, high temperature corrosion	3
3	Important Engineering Materials	Carbon steels, stainless steels, Al and its alloys, Cu and its alloys, Ni and its alloys), Nonmetallics	2
4	Corrosion in Petroleum Industries (upstream and downstream)	Corrosion problems in (a) production, (b) transportation and storage and (c) refinery operations	5
5	Corrosion Resistant Materials for Chemical Industries	Materials (metallic/nonmetallic) for sulfuric acid, nitric acid & hydrochloric acid	3
6	Corrosion Prevention in Petroleum Industries	Alteration of environment (changing medium, inhibitors)	3
		Cathodic and Anodic Protection	
		Coatings (metallic and inorganic)	

7	Modern Theory of Corrosion and Application	Thermodynamics (Free energy, Cell potentials, EMF series), Electrode Kinetics, Predicting corrosion behaviour, Corrosion Rate Measurement	6
8	High Temperature Corrosion	Mechanism and Kinetics, High Temperature Materials, Metal-Gas Reaction (Hot corrosion of alloys)	3
<b>Total</b>			<b>28</b>

#### 4. Readings

##### 4.1 Text Books:

1. Corrosion Engineering (third edition) by Mars G. Fontana, Tata McGraw-Hill.
2. Corrosion and Corrosion Control: An Introduction to Corrosion Science and Engineering (third edition) by Herbert H. Uhlig and R. Winston Revie, John Wiley and Sons.
3. Corrosion Engineering: Principles and Practice (first edition) by Pierre R. Roberge, McGraw-Hill.

##### 4.2 Reference Books:

1. Principles and Prevention of Corrosion (second edition) by D.A. Jones, Prentice-Hall.

5. **Outcome of the Course:** Upon completion of this course, students will be able to rationally arrive at the solutions for corrosion mitigation. They will also be able to select the materials for corrosion control and to analyze the failures caused by corrosion.