

20PEB332E					Corrosion Studies in Petroleum Industry					
Teaching Scheme					Examination Scheme					
L	T	P	C	Hrs/Week	Theory			Practical		Total Marks
					MS	ES	IA	LW	LE/Viva	
2	0	0	2	2	25	50	25	--	--	100

**COURSE OBJECTIVES**

- To acquire the basic concept of corrosion mechanism and forms of corrosion
- To acquire the concept of corrosion testing
- To acquire the concept of the modern theory of corrosion
- To understand the basic mechanism and procedure of corrosion testing and prevention

**UNIT 1****7 Hrs.**

Corrosion fundamentals, Corrosion in oil Industry, Cost of corrosion in the industry, Corrosivity of hydrocarbon fluids:- Water-oil emulsion and multiphase flow regime, Wettability of metal surface., Corrosivity of aqueous phase in hydrocarbon fluids; Sulphur and H<sub>2</sub>S in hydrocarbon fluids; Influence of oil chemistry on the Corrosivity of the aqueous phase. Pipeline corrosion; Kinetics of electrochemical surface reactions; Cathodic reduction reactions; Anodic dissolution reactions; Transport of species; Transport from the bulk solution to the steel surface; Transport through the porous surface scales. Corrosion products; Kinetics of corrosion products precipitation and corrosion products growth;

**UNIT 2****7 Hrs.**

Modes of internal corrosion attack: -Uniform corrosion; Localized corrosion ; Pitting corrosion; Erosion corrosion; Galvanic corrosion; Intergranular corrosion; Stress corrosion cracking; Hydrogen damage; hydrogen embrittlement; Hydrogen-induced cracking; Formation of hydride. Pipeline flow Corrosivity: Effect of water wetting; Effect of multiphase flow regime; Effect of multiphase velocity ; Effect of water phase characteristics; Significance of salinity; Significance of CO<sub>2</sub> pressure; Significance of H<sub>2</sub>S; Significance of O<sub>2</sub>; Significance of pH; Effect of temperature. Materials selection:-Significance of alloying composition; Significance of steel microstructure.

**UNIT 3****6 Hrs.**

Experimental setups, methods, and standards:- Multiphase flow loop; Autoclave; Horizontal rotating cylinder; High velocity rig; Glass cell; Goniometer/Tensiometer ; Moisture content measurements ; Slow strain rate test. Corrosivity and corrosion rate determination:- Weight loss measurements; Potentiodynamic polarization and polarization resistance; Electrochemical impedance spectroscopy; Potentiostatic polarization;

**UNIT 4****6 Hrs.**

Pipeline Corrosion control; Environment control; Gas-phase contaminants and degasification; Water presence and dehydration/dewatering; Pipe cleaning; Pigging; Internal coating/liner; Chemical treatment and corrosion inhibitors:-Corrosion control by industrial inhibitors, Application methods; Influence of operating conditions; Solubility, partitioning, and compatibility. Biocides

**Max. 26 Hrs.****COURSE OUTCOMES**

On completion of the course, student will be able to

- CO-1:** understand the basic mechanism of corrosion process
- CO-2:** classify corrosion into different types and forms
- CO-3:** illustrate the influencing factors of pipeline corrosion
- CO-4:** demonstrate the procedure of corrosion testing
- CO-5:** explain the modern theory of corrosion based on thermodynamic and kinetics study
- CO-6:** interpret the preventive measures of corrosion in oil and gas industry

**TEXT/REFERENCE BOOKS**

1. Papavinasam, S (2013) Corrosion control in oil and gas industry, Elsevier.
2. Cicek, Volkan. "Corrosion in Petroleum Industry." Cathodic Protection: Industrial Solutions for Protecting Against Corrosion: 231-245.
3. Nathan, Charles Carb. "Corrosion inhibitors." C. C. Nathan, Editor, published 1973 by NACE, 260 (1973).

**END SEMESTER EXAMINATION QUESTION PAPER PATTERN****Max. Marks: 100**

Part A/Question: &lt;Short Notes, Problems, Numericals&gt;

Part B/Question: &lt;Justification, Criticism, Long answers, Interpretation &gt;

**Exam Duration: 3 Hrs**

&lt;5-7 &gt; Marks (each)

&lt;8-10&gt; Marks (each)