



CORROSION - PART II

PROF. KALLOL MONDOL

Department of Metallurgy and Material Science
IIT Kanpur

TYPE OF COURSE : Rerun | Core | UG

COURSE DURATION : 8 weeks (20 Jul'20 - 11 Sep'20)

EXAM DATE : 27 Sep 2020

PRE-REQUISITES : Chemical Thermodynamics, Phase transformation and Electrochemistry

INTENDED AUDIENCE : Bachelor and Master's students, PhD students working in corrosion

INDUSTRIES APPLICABLE TO : Oil, Chemical and Power sector, Construction

COURSE OUTLINE :

The course will begin with recap of electrochemical polarization and mixed potential theory. Corrosion events and passivity will be discussed on the basis of mixed potential theory. The course will also concentrate on different corrosion protection methods, various test methods to understand corrosion and stress effect in combination of corrosion of metals and alloys. Finally, it will discuss oxidation of metals and alloys.

ABOUT INSTRUCTOR :

Prof. Kallol Mondal is a Professor in the Department of Materials Science and Engineering, IIT Kanpur. His specializations are Phase transformations of metals and alloys, Corrosion and oxidation behavior and Multi-phase steel development.

COURSE PLAN :

Week 1: Introduction: - Electrochemical Polarization: Activation and Concentration polarization and Mixed Potential Theory (Recap)

Week 2: Corrosion events and Mixed Potential Theory - Understanding of corrosion event on the basis of mixed potential theory: Activation controlled and concentration controlled corrosion

Week 3: Passivation and Mixed Potential Theory - Theory of passivity in metals and alloys -

Week 4: Protection of Metals and Alloys and Mixed Potential Theory - Cathodic protection: Sacrificial anode and Impressed current cathodic protection (ICCP) - Industrial application and calculations Protection of Metals and Alloys: - Metal composition and structure - Environmental control over corrosion - Coating - Inhibitor

Week 5: Corrosion experiments - Potentiodynamic test - Galvanostatic test - Linear polarization- Immersion test - Salt fog test

Week 6: Stress effect on corrosion - Stress corrosion cracking (SCC) - Corrosion fatigue - Hydrogen embrittlement

Week 7: Oxidation of Metals and Alloys - Pilling Bedworth Ratio - Thermodynamics of oxidation: Ellingham diagram

Week 8: Oxidation of Metals and Alloys, Kinetics of oxidation - Effect of doping on the oxidation behavior