

**Topic Name:** Electrochemistry and its applications

**Relevant Course Name:** Engineering Chemistry

**Relevant Department:** Common

**Relevant Semester:** First years

**IIT Faculty Name:** Prof. R. Kothandaraman

**IIT:** Madras

**Topic Description and Outline:**

### **Syllabus for Electrochemistry Module**

1. Introduction:
  - a. Current potential relationship
  - b. Standard hydrogen electrode
  - c. Thermodynamics of electrochemical cells
  - d. Application of EMF measurements ( pH determination (glass electrode), Activity coefficients, Equilibrium constants, Solubility products and Potentiometric titrations)
2. Energy Conversion and Storage
  - a. Basics of battery chemistry – illustrated with rechargeable Li ion battery
  - b. Theoretical limit of energy per unit weight
  - c. Quality of a battery
  - d. The nickel-metal hydride battery chemistry
  - e. Polymer electrolyte membrane fuel cells – principle
  - f. Schematic representation of the current-potential relationship in a fuel cell
  - g. Oxygen reduction reaction
3. Corrosion
  - a. Scope and economics of corrosion
  - b. The fundamental electrochemistry of corrosion
  - c. Potential-pH diagrams
  - d. Passivation and its breakdown

- e. Corrosion protection (Bimettalic (galvanic)corrosion, cathodic protection, anodic protection, coatings and inhibitaors)

**Pre- requisites:** +2 level electrochemistry