

CHM307: Electrochemistry and Ionic Equilibria [Cr: 3, Lc:2, Tt:/Lb:1]

This course is an introduction to electrochemistry through theory and a few experiments to understand fundamental electrochemical processes. The course will cover the laws of electrolysis, Arrhenius theory of dissociation, transport number, Debye-Huckel theory, ionic mobility, degree of dissociation and dissociation constants, Debye-Huckel Limiting law and conductometric titrations. Special emphasis will be given on various types of electrochemical cells, standard electrode potentials, liquid junction potential, applications of emf measurements, polarization and overvoltage etc.

- The Laws of electrolysis, Arrhenius theory of electrolytic dissociation, strong and weak electrolytes.
- Migration of ions, the transport number, Hittorf's rule and determination of transport number Conductance in solution, specific conductance, equivalent conductance, determination of conductance, equivalent conductance at infinite dilution
- Kohlrausch's Law and its applications, ionic mobilities, weak electrolytes, degree of dissociation
- Various conductometric titrations
- Ionic strength, Debye-Huckel limiting law
- Electrochemical cells, measurement of EMF, EMF and free energy, Nernst equation and equilibrium constant
- Types of electrodes, construction of electrodes, EMF of cell and electrode potential, standard electrode potential, application of salt bridge, applications of different electrode systems and EMF measurements
- Liquid junction potential, concentration cell, commercial cells, fuel cells
- Polarization, decomposition potential and overvoltage
- Solubility product and activity product, determination of solubility product from EMF
- Dissociation constant of weak acid, applications of solubility and solubility product, measurement of pH, ionic product of water, isohydric solutions, salt hydrolysis and buffer solution, neutralization indicators and their practical applications
- Voltametry Instrumentation, electrodes, voltamogram and its interpretation, Polarography and cyclic voltammetry

Recommended Reading:

- Thomas Engel and Philip Reid, Physical Chemistry, Pearson Publication 2006.
- P. W. Atkins, Physical Chemistry, 8th Edition, Oxford University Press, 2005.
- S. Glasstone, An Introduction to Electrochemistry, Affiliated East West Press 1942.
- P. C. Rakshit, Physical Chemistry, 7th Edition, Sarat Book Distributors, Kolkata, 2004.