

School of Chemistry

Aims and Objectives: Session 2023-2024, Semester 1

Module CH4716: Electrochemistry and Computational Chemistry

Course Title: Conductivity, Equilibrium Electrochemistry, and Electrode Kinetics

Duration: 10 hours

Lecturer: Professor M. Buck

Aims: To develop an understanding of non-ideality of electrolyte solutions and its effect on equilibrium constants, electrolyte solutions and solution conductivity. Learn about the thermodynamics and kinetics of electrochemistry, the structure of the electrode/electrolyte interface, and electrode processes.

Objectives:

1. Conductivity, molar conductivity and ionic mobility in electrolyte solutions.
2. Interactions between species in an electrolyte solution. Debye-Hückel Theory.
3. Nernst equation and its applications. Understanding of the origins of standard electrode potentials and the prediction of spontaneous cell reactions. Learn how the cell potential relates to the Gibbs energy and other thermodynamic parameters.
4. Structure of the electrode/electrolyte interface.
5. Factors determining mass transport in electrochemical reactions. Concentration and potential gradients, and convection.
6. Processes at electrode surfaces. Butler-Volmer equation and its application to electrochemical reactions at an electrode. Techniques to study electrode processes, e.g., cyclic voltammetry.
7. Electrode types, e.g., microelectrode, ion-selective electrode, rotating disc electrode.