Summary
This course aims at familiarizing the student with state of the art applications of electrochemistry in materials science and technology as well as material requirements for electrochemical engineering.

Content
The course includes a revision of the basic concepts of electrochemistry and of the electrochemical techniques followed by the discussion of relevant applications for surface modifications (galvanic coatings technology, surface structuration, micro/nano fabrication) and energy issues (materials for batteries, fuel cells, hydrogen generation) as well materials aspects in electrochemical engineering (catalytic electrodes, analytical electrochemistry).

Keywords
Materials, Electrochemistry, Micro-fabrication, Coatings, Energy generation, Energy conversion

Learning Prerequisites

Required courses
Chimie générale, Introduction à la science des matériaux

Recommended courses
Métaux et alliages

Important concepts to start the course
General chemistry: thermodynamics, kinetics, equilibrium, acid-base and complexation reactions, redox reaction.
Metallurgy: microstructure of metals and alloys, mechanical properties, deformation and rupture.
Physics: electrical circuits, transport phenomena

Learning Outcomes
By the end of the course, the student must be able to:
• Use electrochemical concepts and methods for materials science
• Design micro/nano materials via electrochemical processes
• Structure surfaces with tailored properties
• Design appropriate materials for electrochemical systems
• Analyze electrochemical processes and devices
• Manage electrochemical material fabrication
• Describe electrochemical reactions
• Formulate requirements for energy generation and storage materials

Teaching methods
Ex cathedra with exercises and case studies.

Expected student activities
Active participation during lectures and in the resolution of exercises, group work in case studies

Assessment methods
Oral presentation

Supervision
Office hours No
Assistants No
Forum No
Others Meetings with teacher upon appointment established by email

Resources
Bibliography
Electrochemistry theory: D. Landolt, Corrosion and Surface Chemistry of Metals, CRC/EPFL Press 2007

Ressources en bibliothèque
• Corrosion and surface chemistry of metals / Landolt

Notes/Handbook
Copy of slides available from the website

Websites
• http://tic.epfl.ch