

Advanced General Chemistry

1. **Course number and name:** 020CHACI3 Advanced General Chemistry
2. **Credits and contact hours:** 4 ECTS credits, 2x1:15 contact hours
3. **Name(s) of instructor(s) or course coordinator(s):** Jihane Rahbani
4. **Instructional materials:** Course handouts; in-class problems
Reference : Chimie tout-en-un MP/PT, J'intègre-Dunod

5. Specific course information

a. Catalog description:

The overall aim of this course is to provide students with the basic principles of chemical thermodynamics as well as electrochemistry including the laws of thermodynamics; enthalpy, entropy, internal energy, free energy, chemical potential, phase equilibria; equilibrium constant; Characterization of the intensive state of a system in equilibrium: variance of a system in equilibrium. Optimization of a chemical process; Overvoltage: Current-potential curves; Spontaneous transformations; Batteries and electrolyzers; Mixed potential, Corrosion potential, Corrosion current intensity, Uniform corrosion in acidic or neutral oxygenated medium; Differential corrosion by heterogeneity of the support or the environment; Protection against corrosion.

b. Prerequisites: 020CHGCI1 General Chemistry

c. Required/Selected Elective/Open Elective: Required

6. Educational objectives for the course

a. Specific outcomes of instruction:

- Master the fundamental notions of thermodynamics and use the appropriate language precisely.
- Describe the evolution and energy exchanges of a system during a chemical reaction.
- Predict the evolution of a chemical equilibrium following a disturbance.
- Recognize the different types of reactions likely to occur in aqueous solution, express and calculate their equilibrium constants.
- Use the $i=f(E)$ curves in the determination of thermodynamic and kinetic information about electrochemical systems.

b. PI addressed by the course:

PI	1.3
Covered	x
Assessed	x

7. Brief list of topics to be covered

- Applications of the thermodynamics principles to the chemical reaction in a closed system leading to the study of chemical equilibrium.
- Chemical potential, free enthalpy, chemical affinity, equilibrium constant, variance, displacement and disruption of equilibrium
- Optimization of a chemical process
- Kinetics of electrochemical reactions - Current-potential curves
- Electrochemical nature of corrosion