PONTIFICIA UNIVERSIDAD CATÓLICA DE CHILE
SCHOOL OF ENGINEERING
DEPARTAMENT OF CHEMICAL ENGINEERING AND BIOPROCESSES
ABET COURSE SYLLABI

IIQ2043 PHYSICAL CHEMISTRY

Credits and contact hours:	10 UC credits / 10 hours (2hr40 lectures per week; 1h20m exercise class per week and 6 h. independent learning experiences)
Instructor's name:	Loreto Valenzuela
Course coordinator's name	Loreto Valenzuela
Textbook:	1. "Physical Chemistry", PW Atkins, Freeman and Company. 2. "Problemas Resueltos de Fisicoquímica" (E. Agosin, L. Valenzuela, y J. Cuevas). 3. Thermodynamics of Solutions, J. Wisniak.
Course Catalog Description:	We live in a world of mixtures (Prausnitz, 2000). The air we breath, the food we eat, the gasoline of our cars. Many of our activities are related with the transfer of substances from one mixture to another; in our lungs, the oxygen in air dissolves in the blood; at the laundry, the drop of lipids in the shirt dissolves in the solvent. This occurs because, when two phases are put in contact they tend to interchange their components until the composition of each phase reaches a constant value; these compositions are generally very different from each other; and this difference supports the possibility to separate mixtures in their components during distillation. In this course, we analyze multiple component systems and their phases in equilibrium, for which we need to understand the physical and chemical laws that apply.
Prerequisite Courses:	FIS1523 o IIQ1003 Thermodynamics, QIM100A General Chemistry
Co-requisite Courses:	None
Status in the Curriculum:	Minimum course

Course Learning Outcomes:

1. To apply concepts of energy, heat, and work in systems and processes that involve mass and energy exchange with the surroundings.
2. To apply concepts of internal energy, enthalpy, entropy and especific heat to energy balances, and their thermodynamic relationships.
3. To apply the first and second law of thermodynamics to pure components in open and closed systems.
4. To work with concepts of free energy, chemical potential and fugacity. 5. To work with Maxwell equations for the resolution of thermodynamic relationships of different estate properties.
6. To interpret and apply the fundamental laws of the thermodynamics of the phase equilibrium (e.g., Henry, Raoult and Dalton laws).
7. To calculate temperature, pressure and composition of the components of an equilibrated system for ideal and real binary mixtures.
8. To build and interpret phase diagrams of binary mixtures.
9. To apply fundamental concepts of chemical thermodynamics, reaction heat, free energy, enthalpy, entropy, activity, fugacity and their coefficients to equilibrium systems.
10. To analyzes surface equilibrium.
11. To define and solve thermodynamic problems of equilibrium with and without chemical reaction in charged or uncharged systems.
12. To search for relevant information in public and scientific sources, on topics related to the physical-chemistry.
13. To communicate effectively by written reports and oral presentations.

Relation of Course to ABET Criteria:

a. Knowledge of mathematics, science and engineering
c. Design a system, component, or process
e. Identify, formulate, and solve engineering problems
g. Effective communication
k. Techniques, skills, and modern tools for engineering practice.

Topics covered:

1. Introduction to Physical Chemistry
2. Thermodynamics revision
3. Maxwell Equations
4. Auxiliary State Functions, Gibbs Energy and Chemical Potential
5. Changes of State in Pure components.
6. Changes of State of Multicomponent Systems
6. Phase Equilibrium Thermodynamics in ideal systems
7. Phase Equilibrium Thermodynamics in real systems
8. Excess Properties, activity.
8. Phase Equilibrium with Chemical Reaction
9. Electrochemistry
10. Surface Thermodynamics.

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