Code: **QF431**

Name: **Físico-Química I**

Name in English: **Physical Chemistry I**

Name in Spanish: **Físicoquímica I**

Subject type: **Weekly**

Approval Type: **Grade and Attendance**

Characteristic: **Regular**

Frequency: **75%**

Period Type / Offering period: **Semester / All periods**

Requires Final Exam: **Yes**

Vectors

T	L	P	O	PE	OE	SL	WEEKS	CREDITS
4	**-**	**-**	**-**	**-**	**-**	**4**	**15**	**4**

Occurrence on curriculum: **05, 13, 50, 56**

Pre requirement: ***MA211 + QG108**

Summary: **Gas state: PVT properties of ideal and real gases; van der Waals equation; principle of corresponding states. Basic concepts of Thermodynamics: first, second, and third Laws; thermodynamic functions; thermochemistry; applications. Equilibrium conditions and phase rule: one and multi-component systems. Colligative properties; activity.**

Programa:

I. Concepts of system, surroundings, thermodynamic variables, thermal equilibrium, and properties.
II. Study of the gaseous state: ideal and real gases; intermolecular interactions; gas-liquid transition (liquefaction).
III. Concepts of internal energy, heat, enthalpy, heat capacity, generalized work, and reversibility.
IV. First Law of Thermodynamics; applications to gas systems.
V. Thermochemistry and calorimetry.
VI. Second and Third Laws of Thermodynamics: Entropy, statistical notion.
VII. Fundamental relationships for closed systems.
VIII. Gibbs and Helmholtz functions; concepts of fugacity and chemical activity.
IX. Natural independent variables and Maxwell's relations.
X. Fundamental relationships for open systems; chemical potential.
XI. Fundamental relationships of chemical equilibrium and phase equilibrium; Gibbs phase rule.
XII. Phase diagrams for a component and variation of vapor pressure with temperature and pressure.
XIII. Composition measurements, partial molar quantities.
XIV. Raoult's and Henry's laws.
XV. Phase diagrams for two and three components. Distillation.
XVI. Colligative properties.

Basic Bibliography

1) McQUARRIE, D. A.; SIMON, J. D. **Physical Chemistry: A Molecular Approach**. University Science Books, 1997. 1360 p.
2) LEVINE I. N. **Physical Chemistry.** McGraw-Hill, 2008.
3) ATKINS, P W.; PAULA, J.; KEELER, J. **Physical Chemistry**. Oxford University Press, 2018.

Supplementary Bibliography

1) ALBERTY, R.A.; SILBEY, R.J. **Physical Chemistry**, 2nd edn., Wiley, New York, 1997, 950p.
2) CHAGAS, A. P. **Termodinâmica Química.** Editora da UNICAMP, 2019.
3) ATKINS, P. W. **Físico-Química – Fundamentos**, LTC; 6ª edição (10 outubro 2017), 517 p.
4) ATKINS, P.; JONES, L.; LAVERMAN, L. **Princípios de química**: questionando a vida moderna e o meio

ambiente. 7. Ed. Porto Alegre: Bookman, 2018. 830 p
5) SIMON, J.; MCQUARRIE, D .A. **Molecular Thermodynamics**. 1 Ed. University Science Books, 1999. 672 p