Centre	**University College of Engineering of Vitoria-Gasteiz**
Name of subject	**25109 – Physical Chemistry**
Qualification	**Degree in Industrial Chemical Engineering**
Type	**Compulsory**
Credits	**6 ECTS**
Year	**3**
Term(s)	**1st**
Department	**Chemical and Environmental Engineering**
Language	**Spanish**

Outcomes / Objectives

BRIEF DESCRIPTION OF CONTENT

Thermodynamic and transport properties. Physical and chemical equilibria. Kinetics of chemical reactions. Electrochemistry and surface chemistry. Photochemistry.

OBJECTIVES

1. Have knowledge of and apply the physicochemical fundamentals that allow for the interpretation of transport phenomena in physical and chemical processes, phase equilibria and interface behaviour and adsorption phenomena.
2. Have knowledge of and apply the theoretical-practical concepts of equilibrium chemical systems and the kinetics and mechanism of chemical and photochemical reactions.
3. Have knowledge of and apply the transformations of chemical energy into electrical energy and vice versa and their main industrial applications.
4. Have knowledge and interpret macromolecular physical chemistry and its main applications.

OUTCOMES

1. Be able to interpret the behaviour of fluids and determine their thermodynamic and transport properties.
2. Be able to interpret the behaviour of phase equilibrium systems and equilibrium chemical systems and determine their thermodynamic properties.
3. Be able to determine the reaction rate and the mechanism of chemical and photochemical reactions.
4. Be able to interpret the transformations of chemical energy into electrical energy – and vice versa – and their main industrial applications.
5. Be able to interpret the behaviour of interfaces, the phenomena of physisorption and chemisorptions and their main industrial applications.
6. Be able to interpret the behaviour of macromolecules in solution and in the solid state, and that of colloidal systems and their main industrial applications.
7. Be able to apply thermodynamics and kinetics knowledge to equilibrium systems in the solution of practical cases, proposing different strategies, evaluating possible options and providing a reasoned analysis of the results, working both individually and cooperatively.

Syllabus

Unit 1. Fluids and transport phenomena.
Application of the kinetic-molecular theory to fluids. Thermodynamic and transport properties.

Unit 2. Multicomponent systems. Equilibrium between phases.
Partial molar magnitudes, chemical potential and fugacity. Equilibria in multicomponent systems.

Unit 3. Chemical equilibrium in non-ideal systems.
Thermodynamics of chemical equilibrium. Equilibrium in heterogeneous systems and actual solutions.

Unit 4. Chemical kinetics.
Formal kinetics. Molecular kinetics. Reactions in gas phase and in solution. Catalysis.

Unit 5. Photochemistry.
Photochemical sequences. Primary photochemical processes and their kinetics. Secondary processes.

Unit 6. Electrochemical systems.
Thermodynamics of electrochemical processes. Electrochemical equilibria. Electrochemical kinetics.

Unit 7. Thermodynamics of surfaces and adsorption.
Surface tension and surface phenomena. Thermodynamics of surfaces. Adsorption isotherms.

Unit 8. Macromolecules and colloidal systems.

Methodology

Teaching Method

Face-to-Face Teaching Hours								
Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
45		15						
Student Hours of Non Face-To-Face Activities								
Lectures	Seminars	Classroom practice	Lab. practice	Computer sessions	Clinical practice	Workshops	Industrial workshops	Field practice
45		45						

Assessment System

General criteria

→Written essay exam
→Practical tasks (exercises, case studies or problems)
→Group assignments
→Presentation of assignments, reading...

Bibliography

Basic Bibliography

- LEVINE I.N. Fisicoquímica. Bogotá: McGraw-Hill Latinoamericana S.A., 2004.
- J. A. RODRÍGUEZ RENUNCIO, J.J. RUIZ SANCHEZ Y J.S. URIETA NAVARRO. Termodinámica Química. Madrid: Editorial Síntesis, 2000.
- LEVINE I.N. Problemas de fisicoquímica. Bogotá: McGraw-Hill Latinoamericana S.A., 2005.
- GARRITZ, M. COSTAS Y J. L. GÁZQUEZ. Fisicoquímica (Castellan). Problemas resueltos. Ed. Fondo Educativo Interamericano, 2002.
- J. A. RODRÍGUEZ, J. J. RUIZ Y J. S. URIETA. Problemas Resueltos de Termodinámica Química. Madrid: Ed. Síntesis, 2000.

In-depth Bibliography

- DÍAZ PEÑA M. & ROIG MUNTANER A. Química Física. Madrid: Editorial Alhambra S.A.,1989.
- P. W. ATKINS. Physical Chemistry. Oxford: Oxford University Pres, 2008.

Magazines

- Chemical Physics. Elsevier. http://www.sciencedirect.com
- Chemical Physics Letters. Elsevier. http://www.sciencedirect.com
- Chemical Thermodynamics: Principles and Applications. Elsevier. http://www.sciencedirect.com

Websites

- Grupo de Investigaciones Fisicoquímicas Teóricas y Aplicadas http://www.fisicoquimica-unt.com.ar/congresos.html