BACHELOR STUDIES

Technological biochemistry

3ST YEAR OF STUDY, 1ST SEMESTER

COURSE TITLE	**ELECTROCHEMISTRY AND PHYSICAL CHEMISTRY OF INTERFACES**
COURSE CODE	31010030020SL1213101
COURSE TYPE	**CC**-compulsory (full attendance)
COURSE LEVEL	1st cycle (Bachelor's degree)
YEAR OF STUDY, SEMESTER	3styear of study, 1stsemester
NUMBER OF ECTS CREDITS	6
NUMBER OF HOURS PER WEEK	7 (4 lecture hours + 3 seminar hours)
NAME OF LECTURE HOLDER	Lecturer PhD Iustinian BEJAN Lecturer PhD Daniela DÎRŢU
NAME OF SEMINAR HOLDER	Lecturer PhD Iustinian BEJAN Lecturer PhD Daniela DÎRŢU
PREREQUISITES	Advanced level of English

A	**GENERAL AND COURSE-SPECIFIC COMPETENCES**
	General competences: Physics, Analytical Chemistry, Physical Chemistry, Algebra and Analytical Mathematics **Course-specific competences**: The students will acquire specific knowledge and skills in order to apply the principles of physical chemistry of interfaces in any area of science. Students will also receive training in order to be able to work independently and to release scientific results. Students will enlighten physico-chemical phenomena at interfaces from both a theoretical and from an experimental point of view, strengthen their scientific knowledge on disperse systems.
B	**LEARNING OUTCOMES**
	In order to understand the principles governing the work function of such practically important systems as batteries, fuel cells, corrosion and corrosion protection, electrolysis systems as well as membranes and biomembranes, the chemists must learn the basics of interfacial structure, electrochemical kinetics and transport processes. Another objective of the course could also be seen as a part of heterogeneous reactions and catalysis in general. Students will be able to apply scientific knowledges to perform experimental research in the area of colloidal and interfaces chemistry. The analysis of disperse systems regarding their specific properties is an aoutcome of the present lecture. Students will achieve abilities and gain knowledge to perform evaluation and interpretation of research results in the area of cheistry of interfaces.
C	**LECTURE CONTENT**
	Ionic structure of the electrolytes. Ionization equilibria, pH, buffer solution. The activity concept in electrolyte solution, the Debye-Huckel theory. Conduction and conductivity in electrolytes. Thermodynamic equilibrium in an electrochemical cell. Galvanic cells. Electrode potentials and the SHE scale. The Nernst equation. Primary and secondary batteries, fuel cells. Faraday's laws of electrolysis. The basics of electrochemical corrosion and corrosion protection.

	Disperse systems: definition, classification, structure, characteristics. Characterization methods. Disperse analysis. Thermodynamics of the interfaces, surface tension, Young Laplace equation, capillarity and capillary pressure. Small particles thermodynamics and Kelvin equation The adsorption phenomena. Adsorption isotherms. Gibbs isotherm. Siskovsky isotherm. Freundlich, Langmuir and BET isotherms.
D	**RECOMMENDED READING FOR LECTURES**
	1. Gh.Nemţoi, Electrochimie - Aspecte fundamentale, Editura Tehnopress,Iaşi,2011 2. A. N. Frumkin, B. B. Damaschin, Modern Aspect of Electrochemistry, vol. 3, Editor J. O. M. Bockris Butterworth, London, 1994; 3. R.J. Hunter, *Foundations of Colloid Science*, Clarendon Press, Oxford, 1993 4. Chifu, ,*Chimia coloizilor şi a interfeţelor*, Presa Universitară Clujeană, Cluj-Napoca, 2000 5. D. Myers, *Surfaces, Interfaces and Colloids: Principles and Applications*, 2nd Edition, John Wiley & Sons, Inc., 1999 6. H.J. Butt, K. Graff, *Physics and Chemistry of Interfaces*, John Wiley & Sons, Inc., 2003 7. A.W. Adamson, A. P. Gast, *Physical Chemistry of Surfaces*, 6th Edition, John Wiley & Sons, Inc., 1997.
E	**SEMINAR CONTENT**
	The amount of electricity in the electrolysis process. Galvanic deposition; The electrical conductivity of the electrolyte solutions; The electrode potential; measurement methods; The potentiometric titration; Lead acid battery, electric battery; Numerical applications. The experimental preparation of disperse systems. Determination of particle size distributions and the degree of dispersion. Sedimentation studies in the gravitational field. Investigation of the adsorption of acetic acid on coal. Experimental determination of the physico-chemical parameters for butyl alchool adsorption at aqueous solution – air interface. Surface tension determination. Numerical applications – interface chemistry.
F	**RECOMMENDED READING FOR SEMINARS**
	1. V. Isac, A. Onu, C. Tudoreanu, Gh. Nemţoi, Chimie fizică-Lucrări practice, Editura Ştiinţa, Chişinău, 1995; 2. Gh. Nemţoi, Introducere în electrochimie prin aplicaţii numerice, Editura “Tipo” Moldova, Iaşi, 2001; 3. L. Odochian, *,,Chimie coloidală şi macromoleculară – Partea I – Chimie coloidală”*, curs, I. P. Iaşi, 1989. 4. N. Hurduc şi L. Odochian, Lucrări practice de chimie coloidală şi macromoleculară , Editura I.P.I., 1977.
G	**EDUCATION STYLE**

LEARNING AND TEACHING METHODS	Lecture, Conversation, Laboratory experiment, modeling and simulations
ASSESSMENT METHODS	Written examination.
LANGUAGE OF INSTRUCTION	English and Romanian