Course	**Physical and Colloidal Chemistry II**
Course code	*Ķīmi2005*
Scientific discipline	Chemistry
Scientific sub-branch	Physical chemistry
Credits	4
ECTS credits	6
Total number of study room hours	64
Number of lecture hours	32
Seminars and practical work hours	-
Number of hours of laboratory work	32
Number of hours allocated for the term paper	-

Author of the course
Dr. Chem., Assistant Professor Sergejs Osipovs

Background knowledge (course title, part of the program where the course is to be completed)
General Chemistry; Inorganic chemistry; Physical and Colloidal Chemistry I

Course abstract:
The aim of the course is to provide theoretical and practical skills in physical chemistry, mainly in electrochemistry and disperse system chemistry (colloid chemistry). Lectures describe the theory of electrolytic structure, educating about electrical conductivity, thermodynamics of electrochemical circuits, and physicochemical properties of disperse systems. During practical and laboratory work, students learn the methods of electrochemical measurements, learn how to obtain colloidal solutions and determine their characteristics consequently learning the methods of calculation of thermodynamic equilibrium. In the course work under the guidance of the lecturer, students conduct research using methods of physical chemistry, in addition to independently studying the principles of this method. Students provide a scientific report regarding the research results.

Results:
Upon successful completion of this course, students are able to demonstrate knowledge and understanding of general theories, regularities and technologies of electrochemistry and disperse system chemistry, in-depth knowledge of Arrhenius's dissociation theory and the theory of Strong Electrolytes by Debye-Huckel, as well as have an in-depth understanding of the theoretical foundations of electrochemical analysis methods. Students are able to make calculations of ionic equilibrium of any degree of complexity using Arrhenius's electrolytic dissociation theory, are able to calculate and use ion-interacting activity corrections; Can determine redox reaction thermodynamic parameters in galvanic cells, such as EMF, corrosion rate, disperse system parameters and other measurements. Students have mastered and are able to use basic mathematical data processing techniques, incl. solving multi-parameter optimization tasks using Excel software.

Students are able to formulate a small scientific research task, obtain scientific information about them, perform experiments, create a scientific report on them and present it. The level of student's competence is sufficient for them to be able to independently solve tasks required for research under the guidance of a higher qualification specialist.

Contents of the course:

Subject and matter of colloid chemistry. Features and classification of dispersed systems. Molecular kinetic properties of dispersive systems. Optical and electrical properties of dispersing systems. Surface phenomena. Obtaining and stability of dispersive systems. Coarse dispersed systems. Structure and development of electrochemistry. Arrhenius theory of electrolytic dissociation and equilibria. Theory of strong electrolyte structure. Electrical conductivity. Galvanic electrode thermodynamics. Chemical sources of electric current. Electrochemical kinetics. Overview of applied electro-chemical industries..

Plan of the course:

(shows the content, structure and calendar of the course)
Structure of the course: lectures - 32 h, laboratory works – 32 h

Lecture themes:

1. Subject and importance of colloid chemistry.
2. Features and classification of disperse systems.
3. Molecular-kinetic properties of disperse systems.
4. Optical and electrical properties of disperse systems.
5. Surface phenomena.
6. Obtaining and stability of dispersed systems.
7. Coarse disperse systems.
8. Structure and Development of Electrochemistry.
9. Arrhenius's Electrolytic Dissociation Theory and Balance..
10. Theory of Strong Electrolyte Structure.
11. Electrical conductivity.
12. Galvanic Electrode Thermodynamics.
13. Chemical current sources.
14. Electrochemical kinetics.
15. Overview of Applied Electrochemistry Branches.
16. Overview of Applied Electrochemistry Branches.

Laboratory works:

1.-2. Experimental determination of solubility constant;
3.-4. Ion and electrolyte activity coefficients;
5.-6. Buffer solutions and buffer capacity;
7.-8. Potentiometric titration;
9.-10. Photoelectric colorimetry;
11.-12. Refractometry;
13.-14. Calculation of the sucrose inversion reaction rate constant;
15.-16. Electrochemical Corrosion of Metals.

Requirements for obtaining credit points:

Successful participation in laboratory work 30%, 20% tests during the course; 50% exam at the end of the course.

Reference literature, study materials:

1. Atkins P.W., J.Paula. Physical Chemistry, 7.izd., Oxford, Univ.press. 2002., 1150 lpp.
2. Balodis J. Praktiskie darbi fizikālajā ķīmijā. I, II, III daļa, Rīga, Zvaigzne, 1972-1977.
3. ГерасимовЯ.И. и др. Курс физической химии. Москва, Химия, 2.d., 1970., 656 lpp.
4. Дамаскин Б.Б. и др. Электрохимия, Москва, Химия, Колос С, 2008, 670 с.
5. Практикум по электрохимии, под ред. Дамаскина Б.Б. Москва, Высшая школа, 1991, 288 с.
6. Vojuckis S. Koloīdķīmija. Rīga, Zvaigzne, 1966,479 lpp.
7. Putilova I. Koloīdķīmijas praktikums. Rīga, Zvaigzne, 1972, 299 lpp.
8. Фролов Ю Курс коллоидной химии Москва Химия 1989, 464 с.

Additional literature:

1. Alksnis U. u.c. Fizikālā un koloidālā ķīmija, Rīga, Zvaigzne, 1990., 424 lpp.
2. Ross S.,Marrison I.D. Colloidal Systems and Interfaces. New York, J.Wiley and Sons, 1988., 422 lpp.

Recommended periodical literature

1. J. Chem. Education
2. www.scirus.com

Notes:

What study programs and their parts (A, B, C, D) are relevant to this course:

ABSP „Chemistry”, part A

Name of the course in English:

Physical and Colloidal Chemistry II

Abstract of the course in English:

The course is aimed at providing students with theoretical knowledge of and practical skills in, physical chemistry, more specifically, in electrochemistry and dispersed system chemistry (colloidal chemistry) with the focus on electrolyte structure theory, those of conduction, thermodynamics of electrochemical chains, physical and chemical properties of dispersed systems.