# RTU Course "Physical Chemistry II"

## 32000 Faculty of Natural Sciences and Technology

*General data*

| | |
|---|---|
| Code | ĶNF686 |
| Course title | Physical Chemistry II |
| Course status in the programme | Compulsory/Courses of Limited Choice |
| Responsible instructor | Svetlana Čornaja |
| Volume of the course: parts and credits points | 2 parts, 22.6 credits |
| Language of instruction | LV, EN |
| Annotation | Chemical thermodinamics. The first law of thermodynamics. Enthalpy. The heat of reactions. The second law of thermodynamics. Entropy. The third law of thermodynamics. Thermodynamic potentials. Nernst's heat theorem. Chemical equilibrium. Equilibrium between phases. The Clausius - Clapeyron equation. Raoult's law. Phase diagrams of thermodynamics systems. Cryoscopy. Ebullioscopy. Thermal analysis. Physicochemical analysis. Three - component systems. Electrochemistry. Theory of electrolytic dissociation. Theory of strong electrolytes. Debye-Huckel theory. Conductivity of electrolytes. Galvanic cells. Electromotive forces and electrode potentials. Thermodynamics of galvanic cells. Types of electrodes. Electrochemical kinetics.<br>Electrolysis. Metal corrosion. Kinetics of chemical reactions. Formal kinetics. Chemical kinetic theories . Hard-Sphere collision theory. Activation energy. Arrhenius equation. Transition-state theory. Chain reaction. Catalysis. Homogeneous catalysis. Heterogeneous catalysis. |
| Goals and objectives of the course in terms of competences and skills | The goal of the course is expanding and deepening the knowledge in the basic sections of physical chemistry: chemical thermodynamics, science of chemical and phase equilibrium, sections on electrochemistry, chemical kinetics and catalysis. The goal of the course is showing that science and chemical production utilize and examine in practice the given theoretical findings of physical chemistry |
| Structure and tasks of independent studies | Work with study and reference literature. Work with scientific literature. Preparation of scientific work reports and articles. Preparation for the exam |
| Recommended literature | 1. Čornaja, S. Fizikālā ķīmija. Elektroķīmija. Kinētika. Rīga: RTU izdevniecība, 2008. 135 lpp.<br>2. Silbey, R.J., Alberty, R.A., Bawendi, M.G. Physical Chemistry. 4th ed. New York: John Wiley and Sons, Inc., 2005. 944 p.<br>3. Engel, T., Reid, Ph. Physical Chemistry. San Francisko: Pearson Education, Inc., 2006. 1061 p.<br>4. Atkins, P.W. Physical Chemistry. 3rd ed. New York: W.H.Freeman and Company, 1986. 857 p.<br>5. Laidler, K.J., Meiser, J.H. Physical Chemistry. 3rd ed. Boston – New York: Hoghton Mifflin Company, 1999. 1019 p.<br>6. Maron, S.H., Lando, J.B. Fundamentals of Physical Chemistry. New York: Macmillan Publishing Co. Inc., London: Collier Macmillan Publishers, 1974. 853 p.<br>7. Castellan, G.W. Physical Chemistry. 2nd ed. Addison – Wesley Publishing Company, Inc., 1971. 866 p. |
| Course prerequisites | ĶNF285; ĶNF301 |

*Course contents*

| Content | Full- and part-time intramural studies | | Part time extramural studies | |
|---|---|---|---|---|
| | Contact Hours | Indep. work | Contact Hours | Indep. work |
| Physicals chemistry classification, methods of studies | 4 | 0 | 0 | 0 |
| Laws of thermodynamics | 10 | 0 | 0 | 0 |
| Thermodynamic potentials | 4 | 0 | 0 | 0 |
| Chemical equilibrium. Chemical thermodynamics | 6 | 0 | 0 | 0 |
| Equilibrium between phases | 8 | 0 | 0 | 0 |
| Theory of electrolytes | 4 | 0 | 0 | 0 |
| Conductivity of electrolytes | 4 | 0 | 0 | 0 |
| Galvanic cells. Electromotive forces and electrode potentials | 4 | 0 | 0 | 0 |
| Thermodynamics of galvanic cells | 4 | 0 | 0 | 0 |
| Electrochemical kinetics | 4 | 0 | 0 | 0 |
| Metal corrosion | 3 | 0 | 0 | 0 |
| Kinetics of chemical reactions | 5 | 0 | 0 | 0 |
| Catalysis | 4 | 0 | 0 | 0 |
| Total: | 64 | 0 | 0 | 0 |

*Learning outcomes and assessment*

| Learning outcomes | Assessment methods |
|---|---|
| Ability to demonstrate knowledge and understanding of the most recent physical chemistry theories and findings | Exam |
| Ability to demonstrate good management of research methods in physical chemistry | Scientific work plan, exam |
| Ability to pose without assistance the idea of research, plan and structure scientific work in the field of physical chemistry | Scientific work plan, reports, articles, exam, dissertation |
| Ability to perform an original research of a significant amount in the field of physical chemistry | Scientific work plan, reports, articles, exam, dissertation |
| Ability to perform professional work in science, study process and production, utilizing the achieved theoretical basics and skills | Exam, dissertation |

*Study subject structure*

| Part | CP | Hours | | | Tests | | |
|---|---|---|---|---|---|---|---|
| | | Lectures | Practical | Lab. | Test | Exam | Work |
| 1. | 11.3 | 2.0 | 0.0 | 0.0 | | * | |
| 2. | 11.3 | 2.0 | 0.0 | 0.0 | | * | |