Course description

Department/Unit /	KCH / FCHE1			**Academic Year**	2016/2017
Title	Physical Chemistry 1			**Type of completion**	Exam
Accredited/Credits	Yes, 4 Cred.			**Type of completion**	Combined
Number of hours	Přednáška 2 [Hours/Week]				
Occ/max	Status A	Status B	Status C	**Course credit prior to**	NO
Summer semester	0 / 0	0 / 0	0 / 0	**Counted into average**	YES
Winter semester	37 / -	1 / -	0 / 0	**Min. (B+C) students**	not determined
Timetable	Yes			**Repeated registration**	NO
Language of instruction	Czech			**Semester taught**	Winter semester
Substituted course	None				
Preclusive courses	N/A				
Prerequisite	N/A				
Informally recommended courses	N/A				
Courses depending on this Course	N/A				

Course objectives:

The discipline familiarizes with bases of thermodynamics and the obtained information is applied for the quantitative description of the equilibrium states of phase, the chemical and electrode systems. An attention is paid to basic, ideally model idea on these systems equilibrium behaviour.

Requirements on student

Requirements
Satisfying the requirements of exam to obtain at least grading "good"

Evaluation of the subject as well as the exam grading is made according to the articles No 31 - 33 in the Regulations on Study and Examinations University of Ostrava

Content

Content
1. Introduction (causalities, approach), comparison of s, l, g states
   Bases of thermodynamics
   The first law of thermodynamics, heat capacities
   PV work (work in changes of volume, reversible/irreversible performance
2. Enthalpy, Mayer equation
   Application of the first law of thermodynamics to ideal gas, isothermal and adiabatic process, reversible and irreversible course
3. The second law of thermodynamics, Carnot cycle. Entropy, definition, Clausius inequality, the entropy changes in the isolated systems, theory of heat death of the universe
4. Significance of entropy, Boltzmann relation. The entropy change calculations for ideal gas, the entropy change at the change of states.
5. The third law of thermodynamics, calculations of the entropy absolute value, criteria of thermodynamics equilibrium, Gibbs, Helmholtz energy, chemical potential, significance, calculations for the gas, ideal and real mixtures. The general condition of the thermodynamics equilibrium.
6. The phase equilibra, Gibbs law of phases, condition of thermodynamics of the phase systems. One-component system, Clapeyron, Clausius-Clapeyron equation, the phase p-T diagram, temperature anomaly of water,
7. Binary system, system liquid - gas, Henry law, the ideal solutions, Raoult law, p-x, T-x diagrams

8. System of solvent with involatile component. Colligative properties, cryoscopy, ebullioscopy, equilibrium water - NaCl, eutonic point.
9. Equilibria of the chemical reactions. Condition of the chemical equilibrium, the equilibrium constant Kp - derivation, significance.
The Gibbs energy change of system in disequilibrium, connection between Kp and Gro
10. Calculation of the Gibbs energy change from the reactive mixture composition, from the Gibbs energy of formation; determination of the Gibbs energy change from the entropy change and the reaction enthalpy; Thermochemistry, heats of combustion, heats of combination, bond enthalpy, atomic heat;
11. The equilibrium constant dependence on temperature, van´t Hoff equation, LeChatelier´s principle;
12. Electrode equilibrium. Internal, phase potential, electrochemical potential, electrodes. Equilibrium potential of electrode, Nernst equation;
13. The galvanic cells (Daniell cell), the electrode reactions under the current course; electrode potential, hydrogen scale, the electrodes classification, Peters equation, thermodynamics of the electrochemical cells, calculation of the enthalpy changes and the equilibrium constant of the electrodes reactions.

Prerequisites - other information about course preconditions

none

Competences acquired

Competences
Knowledge of the basic relations and connections from the field of physical chemistry.
The students acquire ability to orientate in the basic relations and connections from the field of physical chemistry in connection with the laboratory chemical practice. The students understand the basic relations and connections from the field of physical chemistry; they are able to apply them not only to the laboratory chemical practice but also to everyday life.

Studijní opory

Guarantors and lecturers

- **Guarantors:** doc. Mgr. Roman Maršálek, Ph.D.
- **Lecturer:** doc. Mgr. Roman Maršálek, Ph.D.

Literature

- **Basic:** W.J.Moore. *Fyzikální chemie, druhé vydání*. SNTL Praha, 1981.
- **Recommended:** P.W. Atkins. *Physical Chemistry, 6th edition*. Oxford, 1998.
- **Recommended:** P.W.Atkins, C.A.Trap. *Solution Manual for Physical Chemistry, 5th edition*. Oxford, 1994.
- **Recommended:** R.Brdička, J.Dvořák. *Základy fyzikální chemie, druhé vydání*. Praha, 1977.

Time requirements

Activities	Time requirements for activity [h]
Being present in classes	26
Self-tutoring	25
Preparation for an exam	44
Consultation of work with the teacher/tutor (incl. electronic)	5
Total:	**100**

assessment methods

professional knowledge

Continuous analysis of student´s achievements

Dialogue

Oral examination

Written examination

prerequisite

professional knowledge

none

teaching methods

professional knowledge

Dialogic (discussion, dialogue, brainstorming)

Monologic (explanation, lecture, briefing)

Working with text (coursebook, book)

learning outcomes

professional knowledge

Competences
Knowledge of the basic relations and connections from the field of physical chemistry.
The students acquire ability to orientate in the basic relations and connections from the field of physical chemistry in connection with the laboratory chemical practice. The students understand the basic relations and connections from the field of physical chemistry; they are able to apply them not only to the laboratory chemical practice but also to everyday life.

Course is included in study programmes:

Study Programme	Type of	Form of	Branch	Stage	St. plan v.	Year	Block	Status	R.year	R.
Applied Physics	Bachelor	Full-time	Biophysics	1	2012	2016	Povinné předměty	A	2	ZS
Applied Physics	Bachelor	Full-time	Biophysics	1	2014	2016	Povinné předměty	A	2	ZS
Chemistry	Bachelor	Full-time	Chemistry	1	2012	2016	Povinné předměty	A	2	ZS
Chemistry	Bachelor	Full-time	Chemistry with Other Degree Specialization	1	2	2016	Povinné předměty	A	2	ZS
Chemistry	Bachelor	Full-time	Chemistry with Other Degree Specialization	1	2014	2016	Povinné předměty	A	2	ZS
Physics	Bachelor	Full-time	Chemistry with Other Degree Specialization	1	2014	2016	Povinné předměty	A	2	ZS
Biology	Bachelor	Full-time	Experimental Biology	1	2	2016	Povinně volitelné předměty	B	2	ZS
Biology	Bachelor	Full-time	Experimental Biology	1	2016	2016	Povinně volitelné předměty	B	2	ZS