RTU Course "Chemistry for Engineers"

32000 null

General data

Code	ĶVĶ115
Course title	Chemistry for Engineers
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Kristīne Lazdoviča
Academic staff	Zane Ābelniece Māra Plotniece
Volume of the course: parts and credits points	1 part, 2.0 Credit Points, 3.0 ECTS credits
Language of instruction	LV, EN
Annotation	Engineering science students will acquire general knowledge of chemistry and expertise on engineering-important chemical topics such as electrochemistry, corrosion of metals and corrosion protection, and alternative energy sources. The course looks at thermodynamics, heat effects, entalpy, entropy, Gibbs energy, kinetics and balance of chemical reactions. Students will have an idea of dispersed systems, electrolyte water solutions, salt hydrolysis, metal properties, organic and inorganic compounds. Training is focused on learning theoretical and practical knowledge.
Goals and objectives of the course in terms of competences and skills	The aim of the study course is to provide knowledge of basic chemical laws relevant to engineering and environmental quality and the basic principles of the latest technologies. The tasks of the study course: - to provide knowledge of thermodynamic processes and their use, types of dispersive systems in nature and technology; - to develop skills for drinking and technological water quality; - to promote awareness of the characteristics of technological and domestic metals, electrochemical processes, the appropriateness of batteries and other chemical power sources for a specific purpose; - to provide knowledge of alternative energy such as the use of hydrogen energy in engines.
Structure and tasks of independent studies	The student's independent work in preparation for the laboratory works - drawing up the protocol of the laboratory work and acquisition of the theoretical part. Preparation of home works on individual topics, as well as knowledge tests - colloquia on the acquisition of part of the content of the study course.
Recommended literature	Obligātā/Obligatory: 1. Kokars, V. Vispārīgā ķīmija. Rīga: RTU, KTF, 1999, 209 lpp. 2. Kokars, V. Vispārīgā ķīmija. Rīga: RTU, MLĶF, 2009, 286 lpp. 3. McQuarrie, D.A.; Rock, P.A. General Chemistry. 2nd ed. New York: W.H.Freeman and Company, 1997, 876 p. 4. Chang, R. Chemistry. McGraw-Hill Inc. 1991, 516 p. 5. Kampars, V.; Blūms, A.; Brunere, V.; Kamzole, L. Laboratorijas darbi ķīmijā. Augstskolu inženiertehniskajām specialitātēm, vidusskolām un koledžām. Rīga: RTU, 1994, 190 lpp. 6. Kreicberga, J.; Kampars, V. Laboratorijas darbi ķīmijā. Tehnisko augstskolu studentiem. Rīga, 2002, 111 lpp. Papildu/Additional: 1. Steigens, A. Nākotne sākas šodien. Rīga: Nordik, 1999, 221 lpp. 2. Ansone, I.; Kuhare, G.; Puriņa, G. Vides zinību terminu skaidrojošā vārdnīca. LR IZM. Rīga: Jumava, 1999, 252 lpp. 3. Kļaviņš, M. Vides piesārņojums un tā iedarbība. Rīga: LU, 2009, 199 lpp. 4. Ryden, L.; Migula, P.; Anderson, M.; Lehman, M. Environmental science. Uppsala: The Baltic University Press, 2003, 824 p. 5. Shultz, M. J. Chemistry for Engineers : An Applied Approach. Boston, New York: Houghton Mifflin, 2007, 522 p.
Course prerequisites	Science and chemistry knowledge at general secondary education level.

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Thermodynamics. Heat effects of processes. Entalpy, entropy. Gibbs energy.	2	1	1	2
Chemical kinetics. Equilibrium of chemical reactions.	2	1	0	3
Disperse systems. Water solutions of electrolites. Hydrolysis of salts.	2	1	1	2
General properties of metals. Chemical properties of metals.	2	1	0	3
Electrochemistry. Galvanic cells. Sources of current - batteries, accumulators.	2	1	1	2
Corrosion of metals, forms of corrosion. Methods of protecting metals from corrosion.	2	1	0	3
Organic compounds.	2	1	1	2
Home work. Organic compounds and polymers.	0	8	0	8
Inorganic compounds.	2	1	0	3

Laboratory works.	16	12	8	20
Colloquia.	4	8	0	12
Counselling.	4	4	0	8
Total:	40	40	12	68

Learning outcomes and assessment

Learning outcomes	Assessment methods
Is able to evaluate thermodynamic processes, their energy effects, compare the energy capacity of substances, assess the dynamism of the chemical equilibrium.	Test form: development, execution and presentation of laboratory works. Criteria: student is capable of analyzing and calculating the entalpy, entropy, and Gibbs energy of chemical reactions, understands the balance of reversible chemical reactions.
Is familiar with disperse systems in domestic situations and technologies.	Test form: development, execution and presentation of laboratory works. Criteria: student can describe disperse systems, compare randomly selected examples.
Is familiar with the properties of metals and their significance in electrochemical processes.	Test form: colloquia. Criteria: student can calculate and assess metal corrosion and recommend a suitable protective method.
Is able to evaluate significance of chemical sources of current and suitability for an existing situation.	Test form: development, execution and presentation of laboratory works. Criteria: student can calculate an EDS for a given galvanic element and compare them with each other.
Is able to distinguish classes of organic compounds and polymers.	Test form: preparation of homework. Criteria: student understands the role of functional groups in the classification of organic compounds.

Evaluation criteria of study results

Criterion	%
Laboratory works	50
Colloquia	40
Homework	10
Total:	100

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	2.0	1.0	0.0	1.0	*		