RTU Course "Unit Operation of Chemical Engineering"

32000 Faculty of Natural Sciences and Technology

General data

Code	ĶVT724
Course title	Unit Operation of Chemical Engineering
Course status in the programme	Compulsory/Courses of Limited Choice
Responsible instructor	Jurijs Ozoliņš
Volume of the course: parts and credits points	1 part, 9.0 credits
Language of instruction	LV, EN
Annotation	In this course attention is paid to the following topics: main processes of chemical technology. Evaporating processes, Calculation of evaporating devices. Distillation: elementary distillation, rectification of liquid compositions, calculation of rectification column. Drying processes in chemical technology, convective and contact dryers, and specific kinds of drying. Sorption processes in chemical technology, construction and calculation of sorption devices. Extraction of liquids and solids, construction of extractors. Distribution of non-homogenous systems – sedimentation, filtrations, centrifuging.
Goals and objectives of the course in terms of competences and skills	The course aim is to introduce student to the main chemical engineering processes and equipment. Tasks of the course is to gain competence in technological processes, equipment construction and principles, the skills of the unit main calculations.
Structure and tasks of independent studies	Experimental data processing, analysis and report preparation, preparation for practical lessons, independent problem solving. Independently designed course work for deeper analysis of the specific process, learn the process of analysis and calculation principles.
Recommended literature	McCabe, Warren L.. Unit operations of chemical engineering / Warren McCabe, Julian C. Smith, Peter Harriott. Boston [etc.] : McGraw-Hill, c2005., xxv, 1140 lpp. : il. Soares, Claire.. Process engineering equipment handbook / Claire Soares. New York [etc.] : McGraw-Hill, 2002., 1492 p. pag.var. : ill. Perry's chemical engineers' handbook / prepared by a staff of specialists under the editorial direction of editor-in-chief Don W. Green, late editor Robert H. Perry. New York [etc.] : McGraw-Hill, c2008., 1 sēj. : il. Fundamentals of heat and mass transfer / Frank P. Incropera ... [et al.]. Hoboken, N.J. : Wiley, c2007., xxv, 997 lpp. : il.
Course prerequisites	Mathematics, physics, physical chemistry, basic engineering graphics

Course contents

Content	Full- and part-time intramural studies		Part time extramural studies	
	Contact Hours	Indep. work	Contact Hours	Indep. work
Classification of chemical engineering processes and equipment. Evaporation, single-stage evaporation unit	4	0	0	0
Evaporation equipment construction, operation and calculation methods	4	0	0	0
Multistage evaporation, multistage evaporation equipment calculation principles. Evaporation by the heat pump.	4	0	0	0
The drying process, Mollier chart for air, drying process statics, balance drying processes.	4	0	0	0
Material balance and heat balance of drying, technological calculation	4	0	0	0
Convective dryer types, contact dryers, special drying ways.	8	0	0	0
Liquid distillation, phase balance in system vapor-liquid. Distillation processes	4	0	0	0
The distillation process calculation. Steam distillation	2	0	0	0
Liquid mixture separation by rectifying, schemes rectifying equipment	4	0	0	0
Rectification column structure and calculation, special distillation methods.	8	0	0	0
Sorption processes. Absorber design, columns with filling, calculation of column design	4	0	0	0
Adsorption processes, characterization of adsorbents, adsorption equipment construction	2	0	0	0
Liquid-liquid extraction, theoretical basis, extractor structure	4	0	0	0
Leaching and washing, the solvent selection, extractor design	2	0	0	0
Heterogeneous gas separation system: settlers, filters, cyclones	3	0	0	0
Liquid heterogeneous systems: settlers, filters, centrifuges	3	0	0	0
Laboratory (5)	18	0	0	0
Practical classes in accordance with the theme of the lecture	14	0	0	0
Total:	96	0	0	0

Learning outcomes and assessment

Learning outcomes	Assessment methods
Student is able to recognize and analyze the basic processes of chemical technology. The ability to analyze the technological processes.	Laboratory work, tutorials, practical classes, examination.
Student is able to manage chemical engineering equipment structure, able to explain the principles of operation. Ability to justify the choice of certain equipment, compare their performance.	Laboratory work, tutorials, practical classes, examination.
Able to carry out a separate process of technological calculations, select the necessary equipment, to make the process of technological scheme. The ability to demonstrate and substantiate selected and compiled in the technological process scheme.	course work.
Able to provide a separate equipment technological calculation: compile the material and heat balance, to identify the key equipment characterizing sizes. The ability to evaluate the results obtained in energy and material consumption, the parameters.	laboratory work, exercises, tests, exam.

Study subject structure

Part	CP	Hours			Tests		
		Lectures	Practical	Lab.	Test	Exam	Work
1.	9.0	4.0	1.0	1.0		*	