

**al-Farabi Kazakh National University**  
**Faculty of Chemistry and Chemical Technology**  
**Department of Physical Chemistry, Catalysis and Petrochemistry**  
**5B072100 – Chemical technology of organic substances**  
**Syllabus**  
**Autumn semester**  
**2020-2021 Academic year**

**Academic course information**

Discipline's code	Discipline's title	Number of hours				ECTS	IWST
		IWS	Lect.	Pract.	Lab.		
OHT 3216	General chemical technology	68	15	0	60	5	7
Lecturer	Kudaibergenov Nurbolat Zharylkasynuly PhD	Office hours		Scheduled			
e-mail	n.zh.kudaibergenov@gmail.com						
Telephone number	8 701 381 52 91	Auditory		306			

Academic presentation of the course	<p><b>Type of course</b> «General chemical technology» is a basic component in the bachelor educational program for specialty “5B072100 – Chemical technology of organic substances”.</p> <p><b>Aim of course:</b> acquaintance with general laws of chemical technology, the most typical chemical-technological processes, reactors and chemical-technological systems (CTS), as well as with the basics of chemical technology in a number of industries and water treatment.</p> <p>As a result of studying of discipline the student will be capable:</p> <ul style="list-style-type: none"> <li>- to describe and outline the main regularities of chemical technology, the most important chemical industries, as well as the raw, energy and environmental problems of the chemical industry;</li> <li>- to use the scientific knowledge for calculation procedure and projection of chemical technology;</li> <li>- to explain the major chemical productions in individual or group educational and research activity, to conduct independently the searching and the analysis of knowledge of chemical and technological processes;</li> <li>- to generalize, interpret and estimate the received results of tutoring (for example, when performing laboratory works and IWS) in the context of discipline;</li> <li>- to analyze and justify the optimal parameters of technological processes;</li> <li>- to make a material and energy balance of chemical-technological processes and estimate the raw, energy resources and ways of their rational and integrated use.</li> </ul>
Prerequisites	Physical chemistry, organic chemistry, fundamental processes and devices of chemical technology
Post requisites	Profile and special disciplines.
References and Resources	<ol style="list-style-type: none"> <li>1. Vassilina G.K. General Chemical technology. Educational Manual. – Almaty: Qazaq university, 2017. - 130 p.</li> <li>2. Beskov V.S. General chemical technology. Textbook for high schools. - M.: Akademkniga, 2005. - 452 p.</li> <li>3. Seitmagzimova G.M. General Chemical Technology: textbook. - Almaty: Association of Higher Educational Institutions of Kazakhstan, 2016. - 291 p.</li> <li>4. Kutepov A.I., Bondarev T.I., Berengarten M.N. General Chemical Engineering. - M.: Akademkniga, 2004. – 528 p.</li> </ol>

	<p>5. Лабораторный практикум по общей химической технологии: учеб. пособие / В. А. Аверьянов, С. А. Баташов, Н. П. Белова и др.]; под ред. В. С. Бескова. - М. : БИНОМ. Лаб. знаний, 2014. - 278 с.</p> <p>6. Kairbekov J.K., Aubakirov E.A., Tashmuhambetova Zh.Kh., Myltykbaeva Z.K., Vasilina G.K. Practical work on General Chemical Technology – Almaty: Kazakh University, 2013. - 108 p.</p>												
Academic policy of the course in the context of university moral and ethical values	<p><b>Academic Behaviour Rules:</b> Compulsory attendance in the classroom, the impermissibility of late attendance. Without advance notice of absence and undue tardiness to the teacher is estimated at 0 points. Submission of assignments (Independent work of students, midterm control, laboratory tasks, projects and etc.) prior to the deadlines. The violation of submission deadlines leads to the deduction of penalty points. The students who not handed over the next task or have got for its performance less than 50% of points, have opportunity to fulfill the specified task according to the additional schedule. The students who have skipped laboratory classes for a good reason, fulfill them in an extra time in the presence of the laboratory assistant, after the admission of the teacher. The students who haven't performed everything types of works, aren't allowed to examination. Besides, at an assessment activity and attendance of students is considered during occupations.</p> <p><b>Academic values:</b> Academic honesty and integrity: independent performance of assignments; inadmissibility of plagiarism, forgery, cheating at all stages of the knowledge control, and disrespectful attitude towards teachers. (The code of KazNU Student's honor) Be tolerant, respect foreign opinion. Objections formulate in a correct form. Plagiarism and other forms of dishonest work are unacceptable. The help and writing off are inadmissible during delivery of IWS, intermediate control and final examination, copying of the solved tasks by other persons, passing an examination for other student. The student convicted of falsification of any information of a course, unauthorized access to the Intranet, using cribs, will receive a total assessment of «F».</p>												
Evaluation and attestation policy	<p><b>Criteria-based evaluation:</b> assessment of learning outcomes in correlation with descriptors (verification of competence formation during midterm control and examinations).</p> <p><b>Summative evaluation:</b> evaluation of the presence and activity of the work in the classroom; assessment of the assignment, independent work of students, The formula for calculating the final grade: Your total assessment will be calculated by a formula: <math>Total - assessment - on - discipline = (BC1 + ME + BC2) * 0,6 + FE * 0,4</math></p> <p>Minimum estimates as a percentage are given below:</p> <table border="0"> <tr> <td>95% - 100%: A</td> <td>90% - 94%: A-</td> <td></td> </tr> <tr> <td>85% - 89%: B+</td> <td>80% - 84%: B</td> <td>75% - 79%: B-</td> </tr> <tr> <td>70% - 74%: C+</td> <td>65% - 69%: C</td> <td>60% - 64%: C-</td> </tr> <tr> <td>55% - 59%: D+</td> <td>50% - 54%: D-</td> <td>0% -49%: F</td> </tr> </table>	95% - 100%: A	90% - 94%: A-		85% - 89%: B+	80% - 84%: B	75% - 79%: B-	70% - 74%: C+	65% - 69%: C	60% - 64%: C-	55% - 59%: D+	50% - 54%: D-	0% -49%: F
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55% - 59%: D+	50% - 54%: D-	0% -49%: F											

**Calendar (schedule) the implementation of the course content:**

Week / date	Topic title (lectures, practical classes, Independent work of students)	Number of hours	Max. score
1	<b>Lecture 1.</b> Introduction. Importance and development of the chemical industry in Kazakhstan. Structure and functional elements of chemical	1	

	production. The technical and economic indicators.		
	<b>Laboratory 1:</b> Introduction to safety in the laboratory and distribution of the work 1) Technology of production of sulfur dioxide calcination pyrites; 2) Technology of production of nitric acid.	2	15
2	<b>Lecture 2.</b> Chemical, schematic and technological schemes. The essence and methods of compiling material and energy balances.	1	
	<b>Independent work of student with teacher (IWST):</b> Consultation on the implementation of the IWS 1	1	
	<b>Laboratory 2:</b> Calculation of consumption coefficients. Letting the theoretical part of the work on the graduation of the rheometer and gasometer.	2	15
3	<b>Lecture 3.</b> Raw materials in the chemical industry. Types and stocks of raw materials. Minerals concentration.	1	
	<b>Laboratory 3:</b> Calculation and preparation of working solutions.	2	15
4	<b>Lecture 4.</b> The water in the chemical industry. Industrial water treatment. Water Purification.	1	
	<b>Laboratory 4:</b> Calculation of the techno-economic indicators of chemical production. Graduations gasometer.	2	15
	<b>IWST:</b> Submission and defence of IWS 1. Water as a raw material and an auxiliary component of production. Sources of water. Industrial water treatment.	1	25
5	<b>Lecture 5.</b> Energy in the chemical industry. Types of energy. Secondary energy resources. Energy problems in the chemical industry and their solutions.	1	
	<b>Laboratory 5:</b> Calculation of the techno-economic indicators of chemical production. Calibrating of rheometer.	2	15
	<b>BC1</b>		100
6	<b>Lecture 6.</b> Catalytic processes. Homogeneous and heterogeneous catalysis.	1	
	<b>Laboratory 6:</b> Preparation of catalysts (aluminosilicate, contact acid, Raney nickel).	2	13
	<b>IWST:</b> Consultation on the implementation of the IWS 2	1	
7	<b>Lecture 7.</b> The classification of fuels. Methods of processing of solid fuels (gasification, carbonization). The device coke ovens. Processing of coke oven gas.	1	
	<b>Laboratory 7:</b> Collect and check the tightness of installation. Analysis of raw material.	2	13
8	<b>Lecture 8.</b> The composition and properties of oil and oil products. Preparation of oil for processing. Primary methods of refining.	1	
	<b>Laboratory 8.</b> Calculation of homogeneous and heterogeneous chemical processes. Production of hydrogen for the hydrogenation of fats.	2	13
	<b>IWST:</b> Submission and defence of IWS 2. Calculation of heat balance.	1	23
9	<b>Lecture 9.</b> Secondary methods of oil refining. Thermal and catalytic cracking of of oil products. Cleaning of oil.	1	
	<b>Laboratory 9:</b> Calculation of heterogeneous catalytic processes.	2	13
10	<b>Lecture 10.</b> Technology of organic substances. Organic synthesis industry, its value, raw material base. Syntheses based on carbon monoxide. Production of methyl alcohol. Physico-chemical basis of the process. Technological scheme. The catalysts of the process.	1	
	<b>Laboratory 10:</b> Carrying out the production of sulfur dioxide	2	25

	calcination pyrites and production of nitric acid. Midterm exam		
	<b>IWST:</b> Consultation on the implementation of the IWS 3	1	
	<b>ME</b>		100
11	<b>Lecture 11.</b> Production of ethanol. Physical-chemical basis of the process. Conditions and process flow scheme	1	
	<b>Laboratory 11:</b> Calculation of the material balance of the reactor of ideal displacement. Carrying out the production of sulfur dioxide calcination pyrites and production of nitric acid.	2	13
12	<b>Lecture 12.</b> Production and processing of acetylene. Production of acetylene by wet method. Using of acetylene.	1	
	<b>Laboratory 12:</b> Calculation of the cascade of reactors and determination of steps. Analysis of the products.	2	13
	<b>IWST:</b> Consultation on the implementation of the IWS 3	1	
13	<b>Lecture 13.</b> Production of pulp	1	
	<b>Laboratory 13:</b> Calculation of the material balance of production of alcohols. Compilation of the material balance of the process. Comparison of the composition of raw materials and product.	2	13
14	<b>Lecture 14.</b> The production of plastics. Production of polyethylene and others polymer. Process parameters. Catalysts.	1	
	<b>Laboratory 14:</b> Calculation of the material balance of the production of acetylene. Letting results. Compiling tables and drawing a graph.	2	13
	<b>IWST:</b> Submission and defence of IWS 3. Calculation of technical and economic indicators.	1	23
15	<b>Lecture 15.</b> Production of rubber	1	
	<b>Laboratory 15:</b> A final report on laboratory work.	2	25
	<b>BC2</b>		100

Dean

Chairman of the Faculty  
Methodical Council

Head of the Department

Lecturer



*[Handwritten signatures]*

Tassibekov H.S.

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