SYLLABUS
Fall semester 2024-2025 academic year
Educational program "7M07103 - Chemical Engineering"

ID and name of course	Independent work of the student (IWS)	Number of credits			General number of credits	Independent work of the student under the guidance of a teacher (IWST)
		Lectures (L)	Practical classes (PC)	Lab. classes (LC)		
102868 Actual problems of mineral processing technology	4	1.7	3.3	-	5	5

ACADEMIC INFORMATION ABOUT THE COURSE

Learning Format	Cycle, component	Lecture types	Types of practical classes	Form and platform final control
Offline	MD. University component	Oral presentation	Seminars	Written (Univer)
Lecturer - (s)	Madi Abilev PhD, Associate professor			
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Assistant - (s)	-			
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ACADEMIC COURSE PRESENTATION

Purpose of the course	Expected Learning Outcomes (LO) * As a result of studying the discipline the student will be able to:	Indicators of LO achievement (ID)
The purpose of the discipline is to form the ability to critically evaluate the technology of processing mineral raw materials	1.explain the principles of operation of main and auxiliary equipment used in technological cycles	1.1 The student can determine the type of equipment used in the technology of mineral processing
		1.2 The student can explain the purpose of devices used in the technology of mineral processing.
	2. assess the modern methods of enrichment of mineral raw materials	2.1 The student can explain the principles of enrichment methods
		2.2 The student can draw conclusions about the condition of the enrichment methods
	3. evaluate technical and economic indicators of technological processes of raw materials processing	3.1 The student can choose the most suitable technological process
		3.2 The student can suggest ways to improve the characteristics of technological process
	4. choose the best technological scheme for the processing of mineral raw materials	4.1 The student knows the basic characteristics of technological schemes
		4.2 The student knows the structure of technological schemes
		4.3 The student can scientifically justify the choice of the optimal technological scheme
Prerequisites	Applied process control for chemical engineering, Advanced process control	
Postrequisites	Physical and chemical bases of processing non-ferrous metallurgy waste, Metallurgical processing of hard reach raw materials, Technology of processing uranium ore	
Learning Resources	**Literature:** 1. Lakshmanan V.I., Roy R., Ramachandran V. Innovative Process Development in Metallurgical Industry. Concept to commission. - Handbook. Springer International Publishing Switzerland, 2016. - 440 pp.	

	2. Azimi G., Forsberg K., Ouchi T., Kim H., Alam S., Baba A.A. (Eds.) Rare Metal Technology. - Springer, 2020. — 379 p. 3. Nusheh M., Ahuett H.G., Arrambide A. Recent Researches in Metallurgical Engineering: From Extraction to Forming. 2-nd Edition. — ITAvE, 2016. — 196 pp. 4. Cecala A.B., O'Brien A.D. et al. Dust Control Handbook for Industrial Minerals Mining and Processing. - CreateSpace Independent Publishing Platform, 2013. — 316 p. 5. Li J., Zhang M. et al. (eds.) Characterization of Minerals, Metals, and Materials. — Springer, 2021. — 613 p. **Research infrastructure** 1. Labs of the department of analytical, colloid chemistry and technology of rare elements **Professional scientific databases** 1. Web of Science 2. Scopus **Internet resources** 1. http://elibrary.kaznu.kz/ru 2. MOOC / video lectures. 3. https://www.twirpx.com/ 4. https://www.sciencedirect.com

Academic course policy	The academic policy of the course is determined by the Academic Policy and the Policy of Academic Integrity of Al-Farabi Kazakh National University . Documents are available on the main page of IS Univer. **Integration of science and education.** The research work of students, undergraduates and doctoral students is a deepening of the educational process. It is organized directly at the departments, laboratories, scientific and design departments of the university, in student scientific and technical associations. Independent work of students at all levels of education is aimed at developing research skills and competencies based on obtaining new knowledge using modern research and information technologies. A research university teacher integrates the results of scientific activities into the topics of lectures and seminars (practical) classes, laboratory classes and into the tasks of the IWST, IWS, which are reflected in the syllabus and are responsible for the relevance of the topics of training sessions and assignments. **Attendance.** The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course. Failure to meet deadlines results in loss of points. **Academic honesty.** Practical/laboratory classes, IWS develop the student's independence, critical thinking, and creativity. Plagiarism, forgery, the use of cheat sheets, cheating at all stages of completing tasks are unacceptable. Compliance with academic honesty during the period of theoretical training and at exams, in addition to the main policies, is regulated by the "Rules for the final control" , "Instructions for the final control of the autumn / spring semester of the current academic year" , "Regulations on checking students' text documents for borrowings". Documents are available on the main page of IS Univer. **Basic principles of inclusive education.** The educational environment of the university is conceived as a safe place where there is always support and equal attitude from the teacher to all students and students to each other, regardless of gender, race / ethnicity, religious beliefs, socio-economic status, physical health of the student, etc. All people need the support and friendship of peers and fellow students. For all students, progress is more about what they can do than what they can't. Diversity enhances all aspects of life. All students, especially those with disabilities, can receive counseling assistance by e-mail madi.abilev@kaznu.edu.kz. **Integration MOOC (massive open online course).** In the case of integrating MOOC into the course, all students need to register for MOOC. The deadlines for passing MOOC modules must be strictly observed in accordance with the course study schedule. **ATTENTION!** The deadline for each task is indicated in the calendar (schedule) for the implementation of the content of the course, as well as in the MOOC. Failure to meet deadlines results in loss of points.
INFORMATION ABOUT TEACHING, LEARNING AND ASSESSMENT	
Score-rating letter system of assessment of accounting for educational achievements	**Assessment Methods**

Grade	Digital equivalent points	points, % content	Assessment according to the traditional system
A	4.0 _	95-100	Great
A-	3.67	90-94	
B+	3.33	85-89	Fine
B	3.0	80-84	
B-	2.67	75-79	
C+	2.33	70-74	
C	2.0	65-69	Satisfactorily
C-	1.67	60-64	
D+	1.33	55-59	
D	1.0	50-54	
FX	0.5	25-49	Unsatisfactory
F	0	0-24	

Criteria-based assessment is the process of correlating actual learning outcomes with expected learning outcomes based on clearly defined criteria. Based on formative and summative assessment.

Formative assessment is a type of assessment that is carried out in the course of daily learning activities. It is the current measure of progress. Provides an operational relationship between the student and the teacher. It allows you to determine the capabilities of the student, identify difficulties, help achieve the best results, timely correct the educational process for the teacher. The performance of tasks, the activity of work in the classroom during lectures, seminars, practical exercises (discussions, quizzes, debates, round tables, laboratory work, etc.) are evaluated. Acquired knowledge and competencies are assessed.

Summative assessment - type of assessment, which is carried out upon completion of the study of the section in accordance with the program of the course. Conducted 3-4 times per semester when performing IWS. This is the assessment of mastering the expected learning outcomes in relation to the descriptors. Allows you to determine and fix the level of mastering the course for a certain period. Learning outcomes are evaluated.

Formative and summative assessment	Points % content
Work in seminars	27
Independent work	18
Colloquium	15
Final control (exam)	40
TOTAL	100

Calendar (schedule) for the implementation of the content of the course. Methods of teaching and learning.

A week	Topic name	Number of hours	Max. ball
	MODULE 1. Introduction to mineral processing		
1	**Lec 1.** Current state of primary processing of minerals in Kazakhstan	1	-
	Sem 1. Complex processing of lead dusts of Zhezkazgan. Modern technologies of processing	2	7
2	**Lec 2.** Problems of flotation enrichment of minerals	1	-
	Sem 2. Losses of valuable components during flotation enrichment of minerals	2	8
	IWST 1. Consultation on the implementation of IWS1	1	-
3	**Lec 3.** Deposits of rare metal raw materials in Kazakhstan	1	-
	Sem 3. General principles of rare metal raw materials study – spectral analysis, quantitative analysis	2	7
	IWS 1. Understanding mineral processing technology and its applications		15
4	**Lec 4.** Features of technology of rare metals and their compounds	1	-
	Sem 4. Production volumes of rare metals	2	8
	MODULE 2. Case-studies of mineral processing in Kazakhstan		
5	**Lec 5.** Modern technologies for processing rhenium-containing mineral raw materials	1	-
	Sem 5. Technological scheme for obtaining rhenium from Zhezkazgan ores: sources of rhenium loss, ways to reduce it.	2	7
	IWST 2. Consultation on the implementation of IWS2	1	-
6	**Lec 6.** Behavior of rhenium in copper ore beneficiation	1	-
	Sem 6. Rhenium losses during enrichment of copper ores of the Zhezkazgan deposit and their technogenic waste	2	8
	IWS 2. Exploring scandium ores processing technology: Techniques, challenges, and applications		15
7	**Lec 7.** Separation of rhenium from copper smelting sludge	1	-
	Sem 7. Colloquium (written)	2	25
Midterm control 1			**100**
8	**Lec 8.** Modern technologies for processing molybdenum-containing mineral raw materials	1	
	Sem 8. Waste-free molybdenum recycling routes	2	6
	IWST 3. Consultation on the implementation of the IWS3	1	
9	**Lec 9.** Obtaining molybdenum from copper-molybdenum and copper, sulfide - oxidized and non-oxidized ores	1	
	Sem 9. Obtaining metallic molybdenum	2	6
10	**Lec 10.** Modern technologies for processing tungsten-containing mineral raw materials	1	
	Sem 10. Waste-free ways of tungsten recycling	2	7
	IWS 3. Copper ores processing technology		15
11	**Lec 11.** Extraction and ion exchange methods for purifying tungsten and its compounds	1	
	Sem 11. Obtaining metallic tungsten	2	7
	IWST 4. Consultation on the implementation of the IWS4	1	

12	**Lec 12.** Vanadium ore beneficiation methods. Vanadium extraction from titanium-magnetite ores and vanadium slags	1	
	Sem 12. Obtaining metallic vanadium	2	7
	IWS 4. Indium processing technology: Extraction methods, challenges, and industrial applications		15
MODULE 3. Issues and prospects of the mineral processing technology			
13	**Lec 13.** Prospects for the development of the rare metal industry	1	
	Sem 13. Integrated processing of industrial waste and rare metal production waste	2	6
14	**Lec 14**. Current issues in the field of rare metal processing technology in Kazakhstan	1	
	Sem 14. Objectives of improving technological processes (waste-free and low-waste processing routes)	2	6
15	**Lec 15.** Scientific contribution of scientists of Kazakhstan to the development of technology for processing rare metal mineral raw materials and the introduction of waste-free and low-waste technologies	1	
	Sem 15. Colloquium (written)	2	25
	IWST 5. Consultation on preparation for the exam	1	
Midterm control 2			**100**
Final control (exam)			**100**
TOTAL for course			**100**

Dean _____ A. Galeyeva

Chair of the Academic Committee

on the Quality of Teaching and Learning_____ Bektemissova A.U.

Head of Department _____ A. Argimbayeva

Lecturer _____ M. Abilev