SYLLABUS
Fall Semester, Academic Year 2026–2027
Educational Program: 6B07201 – Pharmaceutical Production Technology

Course ID and Title	Independent Work of the Student (IWS)	Number of Credits /Hours			Total Number of Credits	Independent Work of the Student under the Teacher's Guidance (IWST)
		Lectures (L)	Seminars (S)	Laboratory Classes (Lab)		
89009 Chemical Technology of Organo-Mineral Compositions	4	15		60	5	6

ACADEMIC INFORMATION ABOUT THE COURSE				
Learning Format	**Cycle, Component**	**Types of Lectures**	**Types of Seminar Classes**	**Type and Platform of Final Assessment**
Offline	Major Course (MC), Elective Component (EC)	Mix	Discussion, Task Completion, Data Analysis	Oral
Lecturer(s)	PhD, Acc. Prof. Kudaibergenova Bates Malikovna			
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ACADEMIC PRESENTATION OF THE COURSE		
Course Objective	**Expected Learning Outcomes (LO)**	**Learning Outcome Achievement Indicators (LAI)**
To develop the ability to classify and characterize organo-mineral compositions for their application in medical materials and technologies for their production.	1. Classify composite materials.	1.1 Describe composite materials.
		1.2 Distinguish the main classes of composite materials.
		1.3 Classify composite materials according to their constituents.
	2. Demonstrate knowledge of component selection criteria, conditions, and methods for obtaining organo-mineral compositions.	2.1 Understand the characteristics of organo-mineral compositions.
		2.2 Select the main constituents of organo-mineral compositions.
		2.3 Demonstrate methods for obtaining organo-mineral compositions.
	3. Select and calculate the composition of organo-mineral systems.	3.1 Determine the properties of organo-mineral compositions.
		3.2 Understand the principles of component selection.
		3.3 Select the optimal composition based on the properties required for practical application of the compositions.
		4.1 Determine the main properties of polymers and mineral components.

	4. Analysis of Compositions Based on Polymers and Mineral Components	4.2 Understand the requirements imposed on compositions intended for the development of pharmaceutical dosage forms.
		4.3 Analyze composite matrices (composite bases).
	5. Understanding the Features and Methods of Immobilizing Biologically Active Compounds on Organo-Mineral Carriers	5.1 Understand the principles governing the incorporation of biologically active substances (BAS)
		5.2 Apply the general principles of incorporating medicinal substances into organo-mineral compositions
		5.3 Select appropriate immobilization methods
Prerequisites	Organic Chemistry, Chemistry of Medical-Biological Polymers, Technology of Pharmaceutical Dosage Form Production.	
Postrequisites	Completion of the Diploma Thesis (Graduation Project).	
Learning Resources	**Educational Literature:** 1. Kerber M.L. et al. Polymer Composite Materials: Structure, Properties, Technology: учебное пособие / edited by A.A. Berlin, 2009. – 556 [4] p. 2. Kudaibergenov S.E., Ibraeva Zh.E., Yashkarova M.G. Composite Hydrogel Materials: monograph, 2011. – 146 [6] p. 3. Polymer Composite Materials: Structure, Properties, Technology: учебное пособие / Educational-Methodical Association in Chemical Technology and Biotechnology, 2014. – 591 [1] p. 4. Beisebekov M.K. Immobilization of Pharmaceutical Preparations: учебное пособие / al-Farabi Kazakh National University. – Almaty: Kazakh University, 2006. – 164 p. 5. Zhumagalieva Sh.N. Immobilization of Pharmaceutical Preparations. Almaty: Kazakh University, 2013. – 84 p., electronic textbook. 6. Toktabayeva A.K. Fundamentals of Polymer Composite Materials Technology. – Almaty: Kazakh University, 2017. – 253 p. **Internet Resources:** 1. http://elibrary.kaznu.kz/ru 2. https://ras.jes.su/dan/s207987840000297-5-1 3. https://cyberleninka.ru	
Course Academic Policy	**The academic policy** of the course is determined by the Academic Policy and the Academic Integrity Policy of Al-Farabi Kazakh National University. The documents are available on the main page of the Univer Information System. Integration of Science and Education. Research work of students, master's students, and doctoral students is an integral part of the educational process. It is organized directly at departments, laboratories, scientific and design units of the university, and student scientific and technical associations. Independent work of learners 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 instructor integrates the results of scientific research activities into lectures, seminar (practical) classes, laboratory	

	classes, as well as into supervised independent work (SIW) and independent work (IW) assignments reflected in syllabi and corresponding to the relevance of educational topics and assignments. **Attendance.** The deadlines for each assignment are specified in the course implementation calendar (schedule). Failure to meet deadlines results in a loss of points. **Academic Integrity.** Practical/laboratory classes and independent work develop the learner's independence, critical thinking, and creativity. Plagiarism, falsification, use of cheat sheets, and copying at all stages of assignment completion are prohibited. In addition to the main policies, observance of academic integrity during the period of theoretical study and examinations is regulated by documents such as the Rules for Conducting Final Assessment, Guidelines for Conducting Final Assessment in the Autumn/Spring Semester of the Current Academic Year, and the Regulations on Checking Test Papers for Copying.
	Principles of Inclusive Education The university's educational environment is designed as a safe space where all learners receive support and equal treatment from instructors and from one another regardless of gender, racial/ethnic background, religious beliefs, socio-economic status, physical health condition, etc. All people need the support and friendship of their peers and classmates. Success for all students is determined by what they can do rather than by what they cannot do. Diversity enriches all aspects of life. All learners, especially persons with disabilities, may receive advisory assistance via phone/e-mail: +7 701 476 5431 / bateskudaibergenova1@gmail.com or through MS Teams: https://teams.microsoft.com/... **MOOC Integration (Massive Open Online Course)** If a MOOC is integrated into the course, all learners must register for the MOOC. The deadlines for completing MOOC modules must be strictly observed in accordance with the course schedule. **Please note!** The deadline for each assignment is indicated in the course implementation calendar (schedule). Failure to meet deadlines will result in a loss of points.

INFORMATION ON TEACHING, LEARNING, AND ASSESSMENT

Letter Grading System for Recording Academic Achievement

Grade	Numerical Equivalent	Percentage (%)	Traditional Grade
A	4,0	95-100	Excellent
A-	3,67	90-94	
B+	3,33	85-89	Good

Assessment Methods

Criterion-referenced assessment is the process of comparing actually achieved learning outcomes with the expected learning outcomes based on clearly developed criteria. It is based on formative and summative assessment.

Formative assessment is a type of assessment conducted during daily learning activities. It serves as a current indicator of student performance and ensures prompt interaction between the learner and the instructor. It helps identify learners' capabilities, detect difficulties, support the achievement of the best possible results, and enables instructors to make timely adjustments to the educational process. Performance of tasks and classroom participation during lectures, seminars, and practical classes (discussions, quizzes, debates, round-table sessions, laboratory

				work, etc.) are assessed. Acquired knowledge and competencies are evaluated. **Summative assessment** is a type of assessment conducted after the completion of a study unit in accordance with the course syllabus. It is carried out 3–4 times during the semester while completing independent student work (ISW). This assessment evaluates the achievement of expected learning outcomes against established descriptors. It allows the determination and recording of the level of mastery of the discipline at a particular stage. Learning outcomes are assessed.	
B	3,0	80-84		**Assessment Components**	**% Percentage of Total Score**
B-	2,67	75-79		Participation and activity during lectures	10
C+	2,33	70-74		Performance in practical classes	25
C	2,0	65-69	Satisfactory	Independent work (IW)	15
C-	1,67	60-64		Colloquium	10
D+	1,33	55-59		Final Assessment (Examination)	40
D	1,0	50-54		Total:	100
FX	0,5	25-49	Unsatisfactor		
F	0	0-24	y		

Course Content Implementation Calendar (Schedule) and Teaching/Learning Methods

Week	Topic Title	Hours	Max. Score
	Module 1. Composite Materials, Their Classification and Properties		
1	**Lec. 1.** Fundamentals of Organo-Mineral Compositions (Introduction)	1	
	Lab. 1. Familiarization with laboratory safety regulations. Introduction to equipment used for the preparation of polymer composites.	3	5
2	**Lec. 2.** Structure and properties of polymer composite materials (informational lecture).	1	
	Lab. 2. Preparing of hydrogel based on a natural polymer	3	5
	SIWT 1. Consultation on Independent Work 1 (IW 1): Physicochemical, rheological, and technological characteristics of binders in polymer composite materials.		
3	**Lec. 3.** Components of polymer composite materials (binders) and their types.	1	
	Lab. 3. Studies of the properties of the obtained gels	3	10
	IWS 1. Physicochemical, rheological, and technological characteristics of binders in polymer composite materials. Collection of materials and preparation of a group presentation on each type of PCM.		10
4	**Lec. 4.** Main types of binders used in medicine and requirements for them.	1	
	Lab. 4. Preparing of a hydrogel based on a synthetic polymer	3	10
	SIWT 2. Consultation on Independent Work 2.		
5	**Lec. 5.** Main methods of obtaining binders (discussion).	1	
	Lab. 5. Studies of the properties of the obtained gels	3	10
Module 2. Polymer Composite Materials in Pharmaceutical Dosage Forms			
6	**Lec. 6.** Polymer composite materials in sustained-release dosage forms, their role, and fundamental principles of immobilization	1	
	Lab. 6. Determination of swelling capacity in water by the volumetric method.	3	10
7	**Lec. 7.** Synthetic and natural carriers used in PCM. Requirements for medical polymer carriers.	1	

	Lab. 7. Determination of swelling capacity in water and physiological medium using the volumetric method	3	10
	IWS 2. Reinforcing elements in composite materials, their classification and characteristics. Preparation of materials on reinforcing components		10
8	**Lec. 8.** Organo-mineral composite materials and their features	1	
	Lab. 8. Report for lab work and control work	3	20
	SIWT 3. Colloquium covering topics from Weeks 1–8.		
9	**Lec. 9.** Intercalation method in organo-mineral composite technology. Methods for obtaining composite materials	1	
	Lab. 9. Methodology for producing polymer films	3	10
	SIWT 4. Consultation on Independent Work 3. Sustained-release drug delivery systems, requirements for sustained-release systems, and the necessity of prolonging drug action		
10	**Lec. 10.** Methods for studying polymer composite materials	1	
	Lab. 10. Studies of the properties of the obtained films	3	10
11	**Lec. 11.** Organo-Mineral Hydrogels and films	1	
	Lab. 11. Example of preparing of composite consisting of a "natural polymer+extract"	3	10
	IWS 3. Sustained-release drug delivery systems, requirements for sustained-release systems, and the necessity of prolonging drug action		10
12	**Lec. 12.** Immobilization of Biologically Active Substances	1	
	Lab. 12. Investigation of the properties of composite physical gels and their swelling behavior in water	3	
13	**Lec. 13.** Bioactive Organo-Mineral Compositions	1	
	Lab. 13. Investigation of the properties of physical composite gels: determination of swelling capacity in physiological solution	3	10
	SIWT 5. Consultation on Independent Work 4. Classification of medical polymers. According to Origin, Biodegradability, Biological Function, Chemical Structure, Physical Properties, Polymer Architecture, Degradation Mechanism and Medical Application		
14	**Lec. 14.** Controlled Release Systems	1	
	Lab. 14. Investigation of the properties of physical composite gels	3	10
	IWS 4. Consultation on Independent Work 4. Classification of medical polymers. According to Origin, Biodegradability, Biological Function, Chemical Structure, Physical Properties, Polymer Architecture, Degradation Mechanism and Medical Application		10
15	**Lec. 15.** Analytical Methods and Applications and Future Perspectives	1	
	Lab. 15. Calculations of swelling capacity of compositions, graph plotting, and report preparation	3	20
	SIWT 6. Colloquium covering topics from Weeks 8–15.		
LC 2			100
Final Assessment (Examination)			100
TOTAL			100

RUBRICTOR FOR CRITERIAL ASSESSMENT OF SIW

Criterion / score	**Descriptors**				
	"Very good"	**"Very good"**	**"Very good"**	**"Very good"**	
	90-100 points	**90-100 points**	**90-100 points**	**90-100 points**	**90-100 points**

To know and understand the theory and concept of the course	Detailed answers are given to the questions, illustrated with examples where necessary;	The questions were answered correctly as a whole, but with individual inaccuracies that were not in principle.	The answers to the questions are fragmentary, and the correct conclusions are mixed with the wrong ones. The student focuses on the topic of the general course of study, but has difficulty revealing specific problems.	The answers do not correspond to the content of the questions. For the training course, the basic concepts in the questions are misinterpreted.	when no answers to the questions is revealed that the student does not know or understand much or an important part of the teaching material.
Knowledge and understanding of the theory and concept of the course application of the selected methodology and technology to specific applied tasks	The technology and methodology of the course are used in a deep sense, taking into account the specifics of the direction of training students;	The student's answers are poorly structured, the answer contains specific errors that are not important, and he can correct them on his own;	The course tools are used superficially, the content is small, the presented material does not make sense, there is no understanding of interdisciplinary connections.	the student makes serious specific mistakes that he cannot correct on his own, it is difficult for the student to answer most of the additional questions	makes more than 3-4 gross mistakes when answering (to one question) has not fully mastered the material.
Assessment and analysis of the application of the selected methodology to the proposed practical task, justification of the result	indicates the ability to conduct a dialogue and enter into a scientific discussion.	use of methods and technologies of the course, to consolidate their thoughts through the use of scientific concepts, making reproducing knowledge;	Superficial justification of the laws and principles of the course, weak use of the main volume of material in accordance with the curriculum and the requirement of leading questions;	The use of methods and technologies of the course, the manifestation of difficulty in answering questions of a reproductive nature.	Lack of ability to apply course methods when giving examples;

/Dean of the Faculty,
C.ch.sci., acc. prof., Dyusebaeva M.

Head of the Chair
C.ch.sci., prof., Irmuhametova G.S.

Chairman of the Academy of Sciences,
C.ch.sci., acc. prof., Bektemisova A.U.

Lecture, Dr., acc. Professor Kudaibergenova B.M