

SYLLABUS
Spring semester 2024-2025 academic year
The educational program 7M05301 - Chemistry

ID and discipline name	IWS	Amount of hours			Credits	IWSL
		Lec	Pract	Lab		
102971 Actual problems of chemistry of polymer composites	2	1.7	3.3	-	5	6
ACADEMIC INFORMATION ABOUT THE COURSE						
Type of education	Cycle, component		Type of lectures	Type of practical lessons	Form of final control	
Offline	CD, UC, M-6		Presentation, analytical lecture	Seminars	Writing offline	
Lecturer	L.E. Agibayeva PhD, Senior Lecturer					
e-mail	E-mail: Laura.Agibaeva@kaznu.edu.kz					
Phone number	+77013268402					
ACADEMIC PRESENTATION OF THE COURSE						
Aim of discipline	Expected learning outcomes (LO)			Achievement indicators for LO (AI)		
Aim of discipline is to form the ability to develop new methods for obtaining functional polymer composites with a given structure. The training course forms the basis for understanding the latest achievements, current problems and development prospects in the chemistry of polymer composites.	As a result of studying the discipline, the student will be able to:					
	LO 1 Name the basic principles of the directed effect on polymer materials in order to transfer the given properties, improve existing materials; - methods for creating new polymeric materials; - the relationship between the composition, structure and properties of the polymer material, the creation of new materials with a given complex of properties			AI 1.1 Classify polymer composite materials (PCM) by composition, structure and application AI 1.2 Description of PCM properties AI 1.3 Systematic submission of requirements for individual members of the PCM AI 1.4 Systematic presentation of the requirements for PCM		
	LO 2 Determine basic principles and laws of obtaining polymeric materials, depending on their purpose; - methods for calculating the strength properties of polymeric materials; - methods for studying the physico-chemical and technological properties of polymeric materials and their components.			AI 2.1 Description of the operational characteristics of PCM AI 2.2 Systematic presentation of methods for obtaining PCM AI 2.3 Description of individual stages of building PCM		
	LO 3 Apply the knowledge gained when choosing the composition and method of obtaining a specific type of polymer material, depending on the operating conditions			AI 3.1 Selection of PCM synthesis methods AI 3.2 Calculation of the initial conditions for obtaining PCM AI 3.3 Synthesis of PCM according to the selected methodology		
	LO 4 Forecast the operational properties of polymer materials in specific conditions, depending on the type of polymer, methods of influence of various factors on it			AI 4.1 Determination of the main characteristics to determine the correspondence of the properties of raw materials AI 4.2 Determination of the properties of the received PCM		
	LO 5 Appeal with information about the areas of application and the main trends in the development of polymer materials			AI 5.1 Justification of the choice of primary raw materials for obtaining PCM with the required characteristics AI 5.2 Justification of the choice of a method for creating a PCM for its intended use		
Prerequisites	Polymer chemistry, Modern problems of organic chemistry					
Postrequisites	Defense of master dissertation					
Literature and resources	Main literature: 1. Introduction to Polymer Science and Chemistry: A Problem-Solving Approach, Second Edition 2nd Edition / by Manas Chanda, CRC Press; 2nd edition (January 11, 2013) 2. Polymer Chemistry 2nd Edition / by Paul C. Hiemenz, Timothy P. Lodge, CRC Press; 2nd edition (February 15, 2007)					

	3. Semchikov Yu.D. High-molecular compounds: Textbook for universities. Moscow: Academy, 2003, 368. 4. S. Thomas, K. Joseph, S.K. Malhotra, K. Goda, M.S. Sreekala. Polymer composites. – Wiley-VCH, 2012. – 829 p. 5. Irmukhametova G.S. Fundamentals of polymer composite materials technology: textbook for universities; Al-Farabi Kazakh National University. - Almaty: Kazakh University, 2016. - 175 p. Additional literature: 1. Polymer composite materials (part 1): a tutorial / L.I. Bondaletova, V.G. Bondaletov. - Tomsk: Publishing house of Tomsk Polytechnic University, 2013. - 118 p. 2. Polymer composite materials: structure, properties, technology. Edited by Berlin A.A. - St. Petersburg, Publishing house "Profession", 2008. - 560 p. 3. Polymer composite materials: structure, properties, technology: a tutorial / M.L. Kerber et al.; under the general editorship of A.A. Berlin. - St. Petersburg: Profession, 2009.- 556, [4] p. 4. Bataev, A.A. Composite materials. Structure, production, application: a tutorial. manual / A. A. Bataev, V. A. Bataev. - M.: Logos, 2006. - 397, [3] p. - (New University Library). Internet resources: http://www.pslc.ws/russian/index.htm http://www.xumuk.ru/ http://www.hemi.nsu.ru/			
Academic policy of the course	The academic policy of the course is determined by <u>the Academic Policy and the Policy of Academic Integrity of Al-Farabi Kazakh National University</u>. 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 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 sll stages of completing tasks are unacceptable. Compliance with academic honesty during the period of theoretical training and at exam, in addition to the main policies, is resulted by <u>the “Rules for the final control”, “Instructions for the final control of the fall/spring semester of the current academic year”, “Regulations on checking student’s text document for borrowings”</u>. 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 students, 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 Laura.Agibaeva@kaznu.edu.kz or using Zoom conference: https://us04web.zoom.us/j/4143934796?pwd=VGRUTkdjMDVRYy8zY2YvY0RRZkIRUT09 Conference ID: 414 393 4796 Access code: 3D6eZh ATTENTION! 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.			
INFORMATION ABOUT TEACHING, LEARNING AND ASSESSMENT				
Score-rating letter system of assessment of accounting for educational achievements				
Grade	Digital equivalent points	Points, % content	Assessment according to the traditional system	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
A	4.0	95-100	Excellent	
A-	3.67	90-94	Good	
B+	3.33	85-89		
B	3.0	80-84		

B-	2.67	75-79		and the teacher. It allows 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, practical exercises (discussions, quizzes, debates, round tables, laboratory works, etc.) are evaluated. Acquired knowledge and competencies are assessed. Summative assessment is a 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 to determine and fix the level of mastering the course for a certain period learning outcomes are evaluated.		
C+	2.33	70-74		Formative and summative assessment		
C	2.0	65-69		Satisfactory	Activity at lectures	0
C-	1.67	60-64			Work in practical classes	25
D+	1.33	55-59	Unsatisfactory	Independent work	25	
D	1.0	50-54		Design and creative work	10	
FX	0.5	25-49		Final control (exam)	40	
F	0	0-24		TOTAL	100	

Calendar (schedule) for the implementation of the content of the learning course

We ek	Topic name	Amount of hours	Max mark
Module 1. Composition of polymer composites			
1	Lecture 1. Introduction to polymer composites: main definitions and classification. Classification of matrices in polymer composites. The influence of polymer matrix on the properties of composite	1	
1	Seminar 1. The role of polymer composites in modern world: examples of traditional materials replaced by polymer composites	2	
2	Lecture 2. Classification of reinforcements by the shape. Influence of the reinforcements shape on the properties of polymer composite	1	
2	Seminar 2. The differences in properties of polymer composites with different matrices	2	7
3	Lecture 3. Main characteristics of dispersed reinforcements		
3	Seminar 3. Analytical review in properties of polymer composites with different reinforcement shapes	1	7
3	IWSL 1. Consultation on the implementation of IWS1. Application areas of polymer composites	2	
4	Lecture 4. Main types and characteristics of fiber reinforcements	1	
4	Seminar 4. Influence of dispersed reinforcements on the properties of polymer composites	2	14
5	Lecture 5. Short fiber reinforced polymer composites. Orientation and length of fibers	1	
5	Seminar 5. Influence of fiber reinforcements on the properties of polymer composites	2	14
6	Lecture 6. Additives for polymer composites	1	
6	Seminar 6. Differences in properties of polymer composites with fiber and dispersed reinforcement	2	14
6	IWSL 2. Defense of IWS 1. Application areas of polymer composites		15
Module 2. Physics and chemistry of polymer composites			
7	Lecture 7. Theoretical basis for obtaining polymer composites. Interface and interphase bond. Wettability as main criteria for obtaining polymer composites	1	
7	Seminar 7. Advantages of short fiber reinforced polymer composites	2	14
7	IWSL 3. Colloquium		15
7	LEVEL CONTROL 1		100
8	Lecture 8. Adhesion and cohesion, types of bonding components in polymer composites.	1	
8	Seminar 8. Influence of phase structure, type of bonding on the properties of polymer composites. Methods for improving interfacial bonding in polymer composites	2	
9	Lecture 9. Plasticization of polymer composites: types, methods, thermodynamics	1	
9	Seminar 9. Methods of studying the bonding between matrix and reinforcement in polymer composites	2	6
Module 3. Obtaining of polymer composites			
10	Lecture 10. Manufacturing of polymer composites.	1	
10	Seminar 10. Cases of using plasticization for improving properties of polymer composites	2	6
10	IWSL 4. Consultation on the implementation of IWS 2 «Polymer nanocomposites»		

11	Lecture 11. Manufacturing of fiber reinforcements for polymer composites	1	
11	Seminar 11. Differences in properties of polymer composites obtained by different methods	2	12
12	Lecture 12. Manufacturing of dispersed reinforcements for polymer composites	1	
12	Seminar 12. Obtaining of natural fibers for polymer composites	2	12
Module 4. Modern trends in area of polymer composites			
13	Lecture 13. Biodegradable polymer composites. Natural and synthetic biodegradable polymers	1	
13	Seminar 13. Cases of obtaining biodegradable polymer composites, mechanism of their biodegradability	2	12
14	Lecture 14. Magnetic polymer composites. Methods of their obtaining	1	
14	Seminar 14. Cases of obtaining magnetic polymer composites	2	12
14	IWSL 5. Defense of IWS 2 « Polymer nanocomposites»		15
15	Lecture 15. Photocuring polymer composites and methods for their obtaining	1	
15	Seminar 15. Cases of obtaining photocuring polymer composites	2	12
15	IWSL 6. Colloquium		13
15	LEVEL CONTROL 2		100
	Final control		100

SUMMARY ASSESSMENT RUBRICATOR

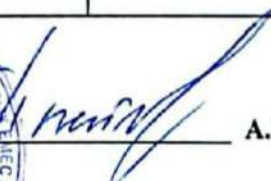
CRITERIA FOR ASSESSING LEARNING RESULTS

Assessment of seminar tasks and individual works of students

Assessment criteria	Excellent (90-100%)	Good (75-89%)	Satisfactory (50-74%)	Unsatisfactory (0-49%)
Volume of completed task	All tasks in the work were completed; the chosen application area is described in detail; several types of polymer composites are described; the solving route and the results are correct.	At least 75% of the task was completed, and the solving route was correct: the materials and equipment were listed correctly, the list of composite materials was described in detail; the composition of composites is not described.	Completed at least 50% of all tasks, the approach to the solution is correct, but there are mistakes; only two of subtasks listed have been fulfilled.	The work was done correctly at least for 50%: materials and equipment are not indicated completely; lack of an answer to some questions.
Creative approach to the task	The work is distinguished by a non-standard, creative approach to topic, problem solving, and design.	Work is independent, demonstrates an attempt to present personal view at the topic, elements of creativity are applied	The student showed interest, but did not demonstrate independence and creative approach in work	The work is standard, formulaic, demonstrates a formal attitude of student
Analysis of information	Analytics is deep and complex	The analytics is high-quality in some places, in some superficial	There are some scattered analytical judgments	Analytics is missing
Argumentation and	Reasonably grounded conclusions, correct and complete	Incomplete interpretation of conclusions, which	Incomplete interpretation of	Incorrect interpretation of

justification of conclusions	interpretation of conclusions, the student expresses and proves his point of view.	does not reflect the essence of the work.	conclusions containing mistakes.	conclusions, or lack of conclusions
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Dean


A.K. Galeyeva

Chairman of the Academic Committee
for the Quality of Teaching and Learning


A.U. Bektemissova

Head of the Department


G.S. Irmukhametova

Lecturer


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