

Ministry of Science and Higher Education of the Republic of Kazakhstan

Buketov Karaganda University

Physical-Technical Faculty

Department of Physics and Nanotechnologies

**THE CURRICULUM (SYLLABUS)**

on the discipline

**«Practical work on theory and methodology of physics teaching»**

for the educational programs 6B01503 - Physics, 6B01504 - Physics-Informatics

Course: 3

Term: 6

Credits: 5

Syllabus discussed at the Chair meeting  
Protocol №10 from 23.05.2024

Approved at the meeting of the Faculty Commission on quality assurance  
Protocol №10 from 20.06.2024



## 1. THEMATIC PLAN OF THE COURSE

№	Theme title	Seminars	IWST	IWS
	Volume of hours			
1	General questions of the theory and methodology of teaching physics	4	2	12
2	Designing the educational process in physics	4	2	12
3	Educational technologies of teaching physics	8	3	13
4	Methods of conducting experiments in teaching physics	7	2	12
5	Problem solving as a method of teaching physics	8	2	12
6	Independent work of students in physics	7	2	12
7	System for testing and evaluating students' knowledge and skills in physics	7	2	12
	Total	45	15	85

## 2. INFORMATION ABOUT TEACHER

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## 3. COURSE POLICY

This training course is organized in accordance with the requirements of the Academic Policy of the E.A. Buketov Karaganda University. It is strongly recommended to pay attention to the possible consequences in case of non-fulfillment of academic requirements and low attendance of classes. In the course of studying this discipline, the teacher and students must follow the Rules of Academic Integrity adopted at the university. The academic policy of the University and the Rules of Academic Integrity are freely available on the website of E.A.Buketov Karaganda University [www.buketov.edu.kz](http://www.buketov.edu.kz), as well as in the Personal account of students. All students/undergraduates/doctoral students are given equal opportunities to participate in the discussion of educational topics in the classroom. Everyone has the right to ask questions and receive answers on the educational topics stated in the Syllabus. The originality of thinking, the creative approach of students when performing tasks of the teacher is welcomed. All students are required to observe an academic culture of behavior, demonstrate mutual respect for each other. Students with special educational needs can take advantage of the right to an individual approach to learning.

## 4. PRE-REQUISITES OF COURSE

Физиканы оқыту әдістемесі, Педагогика, Technique of school experiment, Инновационные технологии в организации учебного процесса в школе, Педагогикалық іс-тәжірибе

## 5. POST-REQUISITES OF COURSE

Methodology of organisation and holding of demonstration experiment in secondary school, Технологии обновленного содержания среднего образования, Practice, writing and defense of diploma work (project).

## 6. BRIEF DESCRIPTION OF THE DISCIPLINE

The purpose of the educational and methodological complex for the academic discipline "Practical work on theory and methodology of physics teaching" is to ensure the effective assimilation by students, future teachers of professional knowledge in this field in general, as well as techniques and methods of teaching physical knowledge with the involvement of tools of modern times in institutions providing general secondary education.

The main objectives of the discipline are mastering by students of the system of theoretical knowledge

on the theory and methodology of teaching physics in institutions of general secondary education; understanding by students of the goals and principles of selecting the content of the physics course; mastering by students of the methodology of applying modern innovative technologies in the educational process, ensuring not only the mastering of the basics of physics by students, but also contributing to their effective intellectual development and education.

## 7. LEARNING OUTCOMES AND METHODS FOR ASSESSING THEIR ACHIEVABILITY

№	Learning outcomes	Methods for assessing the achievability of learning outcomes
1	Knowledge and understanding	principles, methods, forms and means of educational and research work in the field of education and science; methodological features of the study of the main issues of the subject of physics in institutions of general secondary education; plan and conduct physics training sessions
2	Application of knowledge and understanding	analyze, generalize and use innovative pedagogical technologies for organizing the educational process in physics, adequate to the goals, content and conditions of training; to use modern technologies and forms of organization of educational classes in physics, new directions for their improvement, scientific bases of designing classes of different types
3	Formation of judgments	the acquired knowledge allows the student to participate in discussions, form their own independent judgments on the methodology of physics
4	Communicative abilities	the formation of personality traits, communication skills in the process of studying the course contributes to the active realization of oneself in future professional activity
5	Learning skills	readiness for practical actions performed on the basis of acquired experience.

## 8. TEACHING METHODS

According to the source of information transmission: verbal method (discussion, work with the source of educational information), visual method (work with illustrations and diagrams, watching videos), practical method (completing tasks, solving problems, conducting laboratory work, etc.);

By the nature of cognitive activity of students: information-receptive method (the teacher transmits information to students); reproductive (the student performs actions according to a given pattern); method of problem presentation (the teacher formulates the problem and shows logical steps to solve it); heuristic (the teacher breaks the problem into separate tasks, and students solve them); research method (students are looking for ways to solve the tasks problems); project method (students develop a specific project); the method of inverted learning (students master the theoretical topic independently, apply it in practice in the classroom with the participation of a teacher).

## 9. METHODS OF EVALUATION OF LEARNING OUTCOMES:

oral control method, written control method, test control method, portfolio method.

## 10. LIST OF RECOMMENDED SOURCES FOR THE COURSE

№	The title of books
Basic educational and scientific literature	
1	Жанабаева З.Ж., Тынтаева Ш.Б., Жолдасова Х.Б. Физиканы оқыту методикасы. Оқулық - Алматы, 2002. – 119 б.
2	Елисева И.М. Практикум по школьному физическому эксперименту И.М. Елисева, А.А. Луцевич, О.Н. Беляя. – Минск: БГПУ, 2015. – 140 с.
3	Jumadillayev K.N., Sydykova Z.K. Teaching Methodology of Physics: textbook. Ministry of Education and Science of the Republic of Kazakhstan. - Almaty : BookPrint, 2016. - 312 p.

4	Пронина И. И. Теория и методика обучения физике: обзорные лекции : учебно-методическое пособие. – Орск : Издательство Орского гуманитарно-технологического института (филиала) ОГУ, 2017. – 103 с.
5	Современный кабинет физики / под. ред. Г.Г. Никифорова, Ю.С. Песоцкого. – М.: Дрофа, 2012. – 208 с.
6	Берібекова Ф.Б., Жанатбекова Н.Ж. Қазіргі заманғы педагогикалық технологиялар. - Алматы: Қазақ университеті, 2014. - 359 б.
7	Степанов, С.В. Лабораторный практикум по физике / С.В. Степанов, С.А. Смирнов; под ред. С.В. Степанова. – М.: Форум, 2010. – 112 с
8	Файзуллаев А. Физиканы оқыту методикасы. Оқулық - Алматы, Қыздар университеті, 2014. – 338б.
9	Румбешта, Е. А. Курс лекций по теории и методике обучения физике в средней школе : учебное пособие для студентов педагогических вузов / Е.А. Румбешта. – Томск : Издательство Томского государственного педагогического университета, 2016. – 144 с.
10	Алимбекова Г.Б. Болашақ физика мұғалімінің кәсіби даярлығын ғылыми ұғымдар жүйесін қалыптастыру негізінде жетілдіру. – Алматы, ҚазҰПУ, 2014. – 340 б.
11	Акитай Б.Е.. Физиканы оқыту әдістемесі. Оқу құралы - Алматы: Мектеп, 2006.

Additional educational and scientific literature

12	Белая О.Н. Методика преподавания физики в 7 классе / О.Н. Белая, В.С. Самуленков, Н.И. Ковалева. – Минск: БГПУ, 2019. – 94 с.
13	Елисеева И.М. Теоретические основы методики обучения физике: по-сбие. – Минск: БГПУ, 2007. – 74 с
14	Никифорова Г.Г., Песоцкого Ю.С. Современный кабинет физики. – М.: Дрофа, 2012. – 208 с.

Sources on electronic media

15	Мусенова, Э. К. "Физиканы оқытудың теориясы мен әдістемесі" пәні бойынша дәрістер курсы : [ Электронный ресурс] : маманд. 5В060400 "Физика". Қарағанды мемлекеттік университеті. - Электрон. текстовые дан. (389Кб). - Қарағанды : [б. и.], 2014. - 11 дәріс.
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Internet recourses

16	<a href="http://www.physbook.ru/">http://www.physbook.ru/</a>
17	<a href="http://www.physicslab.co.uk">http://www.physicslab.co.uk</a>
18	<a href="http://www.fizika.ru">http://www.fizika.ru</a>

## 11. PLANS OF LECTURE

According to academic curriculum lection complex are not provided.

## 12. PLANS OF SEMINARS

№	Lesson topic	Questions and tasks	Link to the list of recommended sources
1	General questions of the theory and methodology of teaching physics	1. The subject of the methodology of teaching physics, its main tasks. 2. Methods of studying the process of teaching physics. 3. The content of methodical training of a physics teacher. 4. Methods of teaching physics The task: Forms of organization of the process of teaching physics.	[1], [3], [4], [15]
2	Designing the educational process in physics	1. Regulatory and legal support of the educational process in institutions of general secondary education. 2. Types of teacher work planning. 3. Features of the construction of the content of the	[1], [4], [5], [8], [10], [14]

		<p>educational subject "Physics".</p> <p>4. Technology of designing the educational process in physics.</p> <p>The task: After studying the content of the physics curriculum, write down a list of frontal laboratory work, the implementation of which is provided by the program.</p>	
3	Educational technologies of teaching physics	<p>1. Modern educational and methodical complex for teaching physics.</p> <p>2. Methodological and material-technical means of teaching: textbooks, didactic materials, etc.</p> <p>3. Methods of notes and sketches of the physics teacher on the blackboard.</p> <p>4. Physics room and its equipment.</p> <p>5. The main types of physical devices and their features.</p> <p>6. Electronic and technical means of teaching.</p> <p>The task: Make notes and sketches on the blackboard for a physics lesson on topics of physics of 7-8 grade.</p> <p>The methodology of studying the basic concepts of the 7th grade topics</p>	[6], [10], [8]
4	Methods of conducting experiments in teaching physics	<p>1. The importance of laboratory work in the course of physics.</p> <p>2. Forms of organization of laboratory work in physics in secondary educational institutions.</p> <p>3. Organization and methodology of frontal laboratory classes.</p> <p>4. The methodology of the demonstration experiment.</p> <p>5. Measurement errors and their evaluation.</p> <p>6. Means of making laboratory work.</p> <p>The task:</p> <p>1. Prepare a fragment of the lesson using a demonstration experiment (according to plan, topics of physics 7-8 grade)</p> <p>2. Make a graph diagram for laboratory work:</p> <p>1. Verification of the law of conservation of mechanical energy.</p> <p>2. Verification of the law of conservation of momentum.</p> <p>3. Study of the movement of a body thrown horizontally.</p> <p>4. Measurement of the sliding friction coefficient.</p> <p>5. Verification of the Hooke's law.</p> <p>6. Study of the movement of the body in a circle.</p> <p>7. Study of the laws of equidistant motion.</p> <p>8. Measurement of acceleration with equidistant motion of the body.</p> <p>9. Measurement of the focal length and optical power of the collecting lens.</p> <p>10. Study of parallel connection of conductors.</p> <p>11. Study of the serial connection of conductors.</p> <p>12. Measuring the voltage and resistance of the conductor.</p> <p>13. Assembling an electrical circuit and measuring the current in it.</p> <p>14. Measurement of the specific heat capacity of a</p>	[2], [4], [7], [15]

		<p>substance.</p> <p>15. Comparison of the amounts of heat during heat exchange.</p> <p>3. The methodology of studying the basic concepts of the 8th grade topics</p>	
5	Problem solving as a method of teaching physics	<p>1. The role of educational tasks in teaching physics.</p> <p>2. Classification of problems in physics.</p> <p>3. The structure of the process of solving physical problems, its main stages.</p> <p>4. Algorithmic approach to solving problems in physics.</p> <p>5. Methods of conducting classes on solving problems (types of classes, organizational forms, etc.).</p> <p>The task:</p> <p>1. Select typical tasks on the topic, determine their level of complexity and solve them.</p> <p>2. The methodology of studying the basic concepts of the 9th grade topics</p>	[1], [3], [4], [15]
6	Independent work of students in physics	<p>1. Types of independent work of students.</p> <p>2. Didactic principles and requirements for the organization of independent work.</p> <p>3. Methods of organizing independent work of students.</p> <p>4. Independent work of students with educational literature.</p> <p>5. Home independent work of students.</p> <p>6. Features of the organization of independent work of students in high school</p> <p>The task:</p> <p>1. Plan the independent work of students on five levels of complexity by topic, solve it (8-11 grade).</p> <p>2. The methodology of studying the basic concepts of the 10th grade topics</p>	[1], [4], [5], [8], [10]
7	System for testing and evaluating students' knowledge and skills in physics	<p>1. The significance and objectives of checking and evaluating students' achievements in physics.</p> <p>2. Functions and types of verification and evaluation of student achievements.</p> <p>3. Methods and forms of testing students' knowledge and skills in physics.</p> <p>4. Methodological features of the organization of control of students' knowledge and skills in physics.</p> <p>5. Assessment of knowledge and skills in physics and their self-assessment by students.</p> <p>The task:</p> <p>1. Compose questions for physical dictation on topics:</p> <p>1. Pressure of solids, gases and liquids.</p> <p>2. A unified picture of the world.</p> <p>3. Conservation laws in mechanics.</p> <p>4. Magnetic field. Electromagnetic induction.</p> <p>5. Mechanical movement and interaction of bodies.</p> <p>6. Mechanical vibrations and waves.</p> <p>7. Optics.</p> <p>8. Fundamentals of dynamics.</p> <p>9. Fundamentals of kinematics.</p> <p>10. Fundamentals of the special theory of relativity.</p>	[1], [4], [5], [8], [10]

	11. Fundamentals of thermodynamics. 12. Constant electric current. 13. Operation and power. Energy. Simple mechanisms. 14. Light phenomena. 15. Thermal phenomena. 16. Physics of the atom. 17. Photons. The actions of light. 18. Electric current in various environments. 2. The methodology of studying the basic concepts of the 11th grade topics	
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### 13. PLANS OF LABORATORY WORKS

According to academic curriculum laboratory works are not provided.

### 14. PLANS OF EMPLOYMENT WITHIN THE INDEPENDENT WORK OF STUDENT UPON TEACHER GUIDANCE

№	Lesson topic	Tasks
1	General questions of the theory and methodology of teaching physics	1. Methods and methodological techniques of teaching physics. Classification of teaching methods. 2. The system of forms of organization of training sessions in physics. Classification of different types of physics classes The task: Prepare a reference summary with answers to the following questions: 1. Software and methodological support of the physics course in secondary school. 2. Requirements for the formation of a culture of oral and written speech in general education institutions in physics classes. 3. Requirements for conducting training, control, examination papers and work on errors in the process of teaching physics. 4. The list, the order of registration and maintenance of student notebooks in physics. 5. Requirements for the design of a class journal, maintenance and registration of a student diary. 6. What is fixed on the blackboard? 7. Requirements for the design of the blackboard. 8. Technology of drawing up a reference summary
2	Designing the educational process in physics	1. Scientific and methodological analysis of the topic "Work and power. Energy. Simple mechanisms". Formation of the concepts of "Energy" and "Work" when studying the topic. 2. Methodology for studying simple mechanisms (levers, blocks, equilibrium conditions, efficiency coefficient) in the topic "Work and power. Energy. Simple mechanisms". The task: Using calendar and thematic planning, fill in the table: 1) for 7 <sup>th</sup> grade; 2) for 8 <sup>th</sup> grade; 3) for 9 <sup>th</sup> grade; 4) for the 10 <sup>th</sup> grade; 5) for the 11 <sup>th</sup> grade.
3	Educational technologies of teaching physics	1. The system of tasks in the section "Oscillations and waves" and the methodology of teaching them to solve in institutions of general secondary education. 2. Scientific and methodological analysis of the topic "Optics" in teaching physics in institutions of general secondary education. 3. Methodological options for studying the basic concepts and laws of geometric optics when teaching physics in institutions of general secondary education.

		The task: Draw up a reference summary of the physics lesson on the topics physics of the 7-11 grade
4	Methods of conducting experiments in teaching physics	<ol style="list-style-type: none"> <li>1. Methods of laboratory work.</li> <li>2. Skills and abilities that a teacher must possess to demonstrate an experiment.</li> <li>3. Criteria for the selection of demonstrations, laboratory work and experimental studies.</li> <li>4. The system of assistance to students during a laboratory experiment.</li> <li>3. Application of modern electronic and technical means.</li> </ol> <p>The task:</p> <ol style="list-style-type: none"> <li>1. Develop problem tasks for laboratory work.</li> <li>2. Select several demonstration experiments that meet such requirements as emotionality and short duration (taking into account the school curriculum)</li> </ol>
5	Problem solving as a method of teaching physics	<ol style="list-style-type: none"> <li>1. Scientific and methodological analysis of the topic "Fundamentals of dynamics".</li> <li>2. Methodological options for introducing the basic concepts of the topic.</li> <li>3. Methods of studying Newton's laws in the topic "Fundamentals of dynamics".</li> <li>4. Methodological options for studying the law of universal gravitation, Hooke's law and friction forces in the topic "Fundamentals of dynamics".</li> </ol> <p>The task: Make a test paper on the topic and solve it:</p> <ol style="list-style-type: none"> <li>1. Units of measurement of physical quantities. Measuring instruments. Measurement of length and area.</li> <li>2. Basic concepts of the molecular theory of the structure of matter. Weight. The density of the substance.</li> <li>3. Mechanical movement.</li> <li>4. Interaction of bodies. Power.</li> <li>5. Work and power. Energy. Simple mechanisms.</li> <li>6. Pressure.</li> <li>7. Calculation of the amount of heat during heating and cooling. Combustion. Melting.</li> <li>8. Electrical resistance. Ohm's law.</li> <li>9. Electrical phenomena.</li> <li>10. Light phenomena.</li> <li>11. Uniform and uneven movement. Addition of speeds.</li> <li>12. Kinematics.</li> <li>13. Dynamics.</li> <li>14. Conservation laws.</li> <li>15. The basics of MKT. Ideal gas.</li> <li>16. Fundamentals of thermodynamics.</li> <li>17. Electrostatics.</li> <li>18. Magnetic field. Electromagnetic induction.</li> <li>19. Mechanical vibrations and waves.</li> <li>20. Electromagnetic vibrations and waves.</li> </ol>
6	Independent work of students in physics	<ol style="list-style-type: none"> <li>1. Scientific and methodological analysis of the topic "Thermal phenomena" and the methodology for the formation of the concepts of "Heat transfer" and "Internal energy".</li> <li>2. Methodology for the formation of the concepts "Amount of heat" and "Specific heat capacity of a substance" in the topic "Thermal phenomena".</li> <li>3. Methodology for studying the transitions of matter from one aggregate state to another based on ideas about the discrete structure of matter in the topic "Thermal phenomena".</li> </ol> <p>The task: To develop a system of tasks for the formation of</p>



		students' skills to use the textbook on the topics of physics of the 7-11 grade.
7	System for testing and evaluating students' knowledge and skills in physics	<ol style="list-style-type: none"> <li>1. Scientific and methodological analysis of the topic "Electromagnetic phenomena".</li> <li>2. Formation of the concepts of "Electric charge", "Electric field".</li> <li>3. Methodology for the formation of concepts - "Voltage", "Current strength", "Resistance" in the topic "Electromagnetic phenomena".</li> <li>4. Methods of studying the Ohm's law for a section of the circuit and the Joule-Lenz law in the topic "Electromagnetic phenomena"</li> </ol>

## 15. PLANS OF EMPLOYMENT WITHIN THE INDEPENDENT WORK OF STUDENT

№	Lesson topic	Tasks
1	General questions of the theory and methodology of teaching physics	Solve the problems of the following topics: Work and power. Energy. Simple mechanisms. Pressure of solids liquids and gases.
2	Designing the educational process in physics	Solve the problems of the following topics: Electrostatics. Constant electric current. Electric current in various environments
3	Educational technologies of teaching physics	Solve the problems of the following topics: Physics of the atom. Nuclear physics and elementary particles
4	Methods of conducting experiments in teaching physics	Solve the problems of the following topics: Fundamentals of dynamics. Conservation laws.
5	Problem solving as a method of teaching physics	Solve the problems of the following topics: Magnetic field. Electromagnetic induction
6	Independent work of students in physics	Solve the problems of the following topics: Mechanical oscillations and waves. Electromagnetic oscillations and waves
7	System for testing and evaluating students' knowledge and skills in physics	Solve the problems of the following topics: Optics

### 15.1 THE SUBJECT OF WRITTEN WORKS

Presentation:

1. Scientific and methodological analysis of the topic "Mechanical motion and interaction of bodies".
2. Scientific and methodological analysis of the topic "Light phenomena".
3. Scientific and methodological analysis of the topic "Fundamentals of kinematics".
4. Scientific and methodological analysis of the topic "Fundamentals of dynamics".
5. Scientific and methodological analysis of the topic "Electrostatics".
6. Scientific and methodological analysis of the topic "Magnetic field. Electromagnetic induction".
7. Scientific and methodological analysis of the topic "Optics".

## 16. EVALUATION POLICY

№	Lesson topic	Type of activity	Type of task	Report form	Deadline (number of the school week)	Scores
1	Topic 1, 2	Seminar	Control works	Oral interview/ Presentation	2 week	50-100
2	Educational technologies of teaching physics	Seminar	Control works	Presentation	4 week	50-100
3	Topic 1,2, 3	Seminar	Project	Oral / Presentation	6 week	50-100
4	Topic 1-4	ISWT	The methodology	Oral/	7 week	50-100

			of studying the basic concepts of the 7-9th grade topics	Written		
5	Methods of conducting experiments in teaching physics	Seminar	Control Works	Oral interview/ Presentation	9 week	50-100
6	Problem solving as a method of teaching physics	Seminar	Control works	Oral interview/ Presentation	11 week	50-100
7	Independent work of students in physics	Seminar	Control works	Oral interview/ Presentation	12 week	50-100
8	System for testing and evaluating students' knowledge and skills in physics	Seminar	Control works	Oral interview/ Presentation	13 week	50-100
9	Topic 5-7	ISWT	The methodology of studying the basic concepts of the 10-11th grade topics	Oral/ Written	14, 15 week	50-100
10	Topic 1-7	SWT	Preparation presentation	Oral/Written	14,15 week	50-100
11	Midterm 1		Fulfillment of the midterm-control 1 tasks	Test	7 week	50-100
12	Midterm 2		Fulfillment of the midterm-control 2 tasks	Test	14 week	50-100
13	Examination		Fulfillment of examination task	Test	After 15th week	50-100

### Criteria for the total assessment of students for completing tasks

Letter grade	Digital equivalent of points	Percentage	Assessment criterion in the context of the discipline
A	4,0	Excellent 95-100	High level of knowledge of scientific research methods and techniques. Fully familiar with the methods of analytical and independent research work. The issues of the development of computational techniques are studied in detail. Completely completed the research topic and completed all the tasks assigned to him. Provide the entire list of literature on the topics with an indication of the pages of the material used. Exceptional understanding of the material. Complies with the requirements of the teacher and has shown a high level of training.
A-	3,67	Excellent 90-94	Student mastered the methods and methods of scientific research at a high level.

			<p>Got acquainted with the methods of analytical and independent research work.</p> <p>Fully studied the issues of developing computational methods.</p> <p>Completed the research topic in full and completed the tasks set before him.</p> <p>List of references on topics, indicating the pages of the material used.</p> <p>Showed a special understanding of the material.</p> <p>Complies with the requirements of the teacher and showed a high level of training.</p>
B+	3,33	Good 85-89	<p>Student mastered the methods and methods of scientific research at a good level.</p> <p>Well acquainted with the methods of analytical and independent research work.</p> <p>Well studied the issues of developing computational methods.</p> <p>Completed the research topic and completed the tasks set for him.</p> <p>Showed that he understands the material.</p> <p>Complies with the requirements of the teacher and showed a sufficient level of training.</p>
B	3,0	Good 80-84	<p>Student mastered the methods and methods of scientific research at a good level.</p> <p>Well acquainted with the methods of analytical and independent research work.</p> <p>Well studied the issues of developing computational methods.</p> <p>Completed the research topic and completed the tasks set for him.</p> <p>Showed that he understands the material.</p> <p>Complies with the requirements of the teacher and showed a sufficient level of training.</p>
B-	2,67	Good 75-79	<p>Student mastered the methods and methods of scientific research at a normal level.</p> <p>Got acquainted with the methods of analytical and independent research work.</p> <p>Studied the issues of developing computational methods.</p> <p>Completed the research topic and completed the tasks set for him.</p> <p>Showed that he understands the material.</p> <p>Complies with the requirements of the teacher and showed a sufficient level of training.</p>
C+	2,33	Good 70-74	<p>Student mastered the methods and methods of scientific research.</p> <p>Got acquainted with the methods of analytical and independent research work.</p> <p>Studied the issues of developing computational methods.</p> <p>Completed the research topic and partially completed the tasks set for him.</p> <p>Showed an average understanding of the material.</p> <p>Partially complies with the requirements of the teacher and showed a sufficient level of training</p>
C	2,0	Satisfactorily 65-69	<p>Student is partially engaged in analytical and independent research methods.</p>

			<p>Studied the issues of developing computational methods. Did not complete the research topic completely, partially completed all the tasks set for him.</p> <p>Showed an average understanding of the material.</p> <p>Partially complies with the requirements of the teacher and showed a sufficient level of training</p>
C-	1,67	Satisfactorily 60-64	<p>Student is partially engaged in analytical and independent research methods.</p> <p>Did not fully study the issues of developing computational methods.</p> <p>Did not complete the research topic completely, partially completed all the tasks set for him.</p> <p>Showed a low level of understanding of the material.</p> <p>Partially complies with the requirements of the teacher and showed a low level of training.</p>
D+	1,33	Satisfactorily 55-59	<p>Student is engaged in analytical and independent research methods.</p> <p>Did not fully study the issues of developing computational methods.</p> <p>Did not complete the research topic, did not complete all the tasks set for him.</p> <p>Showed a low level of understanding of the material.</p> <p>Does not fully comply with the requirements of the teacher and showed a low level of training</p>
D	1,0	Satisfactorily 50-54	<p>Student is engaged in analytical and independent research methods.</p> <p>Did not fully study the issues of developing computational methods.</p> <p>Did not complete the research topic, did not complete all the tasks set for him.</p> <p>Showed a low level of understanding of the material.</p> <p>Does not fully comply with the requirements of the teacher and showed a low level of training.</p>
FX	0,5	Unsatisfactory 25-49	<p>Student did not fully engaged in analytical and independent research methods.</p> <p>Did not fully study the issues of developing computational methods.</p> <p>Did not fully complete the research topic, did not fulfill all the tasks set for him.</p> <p>Showed a low level of understanding of the material.</p> <p>Does not fully comply with the requirements of the teacher and showed a low level of training.</p>
F	0	Unsatisfactory 0-24	<p>Student is mastered the methods and methods of scientific research at a very low level.</p> <p>Student is not fully acquainted with the methods of analytical and independent research work.</p> <p>Did not study the issues of developing calculation methods.</p> <p>Did not complete the research topic at all, did not complete all the tasks set for him.</p> <p>Did not list the entire list of references on topics, indicating the pages of the material used.</p> <p>Failed to show understanding of the material.</p> <p>Complies with the requirements of the teacher, but did not show the level of training.</p>

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