KBTU KAZAKH-BRITISH TECHNICAL UNIVERSITY

APPROVED
by Dean of SMSaGT
N. Beisenkhanov
«02» 07 2024

SCHOOL OF MATERIALS SCIENCE AND TECHNOLOGY

SYLLABUS

Academic year 2024-2025
Semester: Fall

Discipline: Physics I (PHYS111)

Volume of credits: 3 (1/1/1), 5 ECTS, 3 KZ

Course/Syllabus designer: Umarov Farid Fakhrievich

Instructor's e-mail	f.umarov@kbtu.kz
Class Schedule	**Monday**: Lecture – 10.00-10.50; Aud.444. Practical classes: 11.00-11.50; 12.00-12.50; Aud.216a. 15.00-15.50; 16.00-16.50; Aud.216a. **Tuesday**: Laboratory exercises – 12.00-13.50; 15.00-16.50; Aud.324. **Wednesday**: Laboratory exercises – 10.00-11.50; Aud.324; Practical classes: 13.00-13.50; Aud.222.
Office Hours	
Office	215

1. Course Overview: The discipline "Physics I" is a mandatory discipline of the basic cycle of the working curriculum for training bachelors of technical specialties and includes the following sections: "Mechanics", "Molecular physics and thermodynamics", "Electricity" and "Magnetism", considered in terms of modern scientific achievements. The main elements of teaching the discipline correspond to the main elements of the process of scientific knowledge, such as analysis and synthesis, abstraction, idealization, generalization and limitations, analogies, modeling, formalization, induction and deduction, which gives physics a special intellectual appeal. The applied orientation of the course is strengthened in order to strengthen ties with the relevant major disciplines of the technical specialties.

Prerequisites: Physics, mathematics and chemistry in the scope of the school curriculum.

Postrequisites: Physics II, Electrical Engineering.

2. Aims and objectives: the formation of students' scientific outlook and modern physical thinking, necessary for the development of such special disciplines as Materials Science Organic Chemistry, Physical chemistry, Thermodynamics and Heat Engineering, Hydraulics, Electrical Engineering, Theoretical Mechanics, Theory of Machines and Mechanisms, Strength of Materials, Fundamentals of Industrial and Physical Electronics, Elements and Devices of Automation, Circuitry, Basics of Computer Simulation, Quantum Computing, etc. **The discipline provides for the following classroom activities:** 1) lectures using computer presentations; 2) laboratory work; 3) practical (seminar) classes; 4) independent work of students - classroom under the guidance of a teacher (**SIWT**) and extracurricular (without the participation of a teacher**) SWS**.

3. Learning outcomes: the ability to scientifically analyze problems, processes, and phenomena in the field of physics, the ability to use in practice basic knowledge and methods of physical research; development of techniques and skills for conducting experimental research and computer simulation of physical phenomena, helping to further solve specific engineering problems of the future specialty, developing self-learning skills and creative abilities of students by expanding their independent work.

4. Textbooks and readings: Primary textbook: 1. Fishbane P.M., Gasiorowicz S.G., Thornton S.T. Physics for Scientist and Engineers with Modern Physics. 3rd ed., Pearson Prentice Hall, New Jersey, USA, 2005. 2. Umarov F.F. LECTURES ON PHYSICS 1. Summary, KBTU Publishing House, Almaty, 2006. 3. Trofimova T. I. Course of physics - M.: Higher school. 2001. 4. Volkenstein V.S. Collection of tasks for the general course of physics. St. Petersburg, "Book World", 2003. 5. Umarov F.F., Koshkimbayeva A.Sh. Basic lecture notes on Physics 1, KBTU Publishing House, Almaty, 2007. 6. Umarov F.F., Voronkov V.V., Koshkimbayeva A.Sh., Sultanov A.T. PHYSICS I. LAB MANUAL MECHANICS, MOLECULAR PHYSICS AND THERMODYNAMICS, ELECTRICITY AND MAGNETISM, KBTU Publishing House, Almaty, 2024.

Supplementary textbooks: 7. Ogurtsov A.N. Lectures on Physics I (parts 1 - 4), 2002. 8. Трофимова Т. И., Павлова З. Г. Сборник задач по курсу физики. М., Высшая школа, 2002. 9. ФИЗИКА. Механика и молекулярная физика. Задания к практическим занятиям (под общей редакцией Лагутиной Ж. П.). 10. ФИЗИКА. Электричество и магнетизм. Задания к практическим занятиям (под общей редакцией Лагутиной Ж. П.). 11. Voronkov V.V., Umarov F.F. Problems for the Course of Classical Physics (Physics I). Teaching Aid. KBTU Publishing House, Almaty, 2012. 12. Voronkov V.V., Umarov F.F. Physics I. Problems for IT students. Teaching Aid. KBTU Publishing House, Almaty, 2017. 13. Voronkov V.V., Umarov F.F., Tompakova N.M. Physics I. Problems for KMA students. Teaching Aid. KBTU Publishing House, Almaty, 2015.

5. Lesson Program

Week	Classes				
	Topic	Lecture	Laboratory	Tutorial	Textbook Chapter
1	1. Introduction. Kinematics. Forces in mechanics (SIWT). 2. Dynamics of a material point. Newton's laws. Introductory lesson. Safety engineering. Fundamentals of the theory of measurement error.	1	2	1	Ch.2-5

2	3. Work, energy, power. Collisions. Conservation laws. 4. Mechanics of a rigid body. Deformations of a rigid body (SIWT). Lab.1- Determination of the acceleration of free fall using the Atwood machine.	1	2	1	Ch. 6-9
3	5. Law of universal gravitation. Cosmic velocities. Einstein's Postulates (SIWT). 6. Elements of fluid mechanics. The equation of continuity. Bernoulli's equation and consequences from it. Lab.2- Studying the laws of the dynamics of rotational motion.	1	2	1	Ch.12,16
4	7. Viscosity (internal friction). Laminar and turbulent regimes of fluid flow. 8. Methods for determining viscosity. Movement of bodies in liquids and gases ((SIWT)). Delivery of laboratory works (DLW1)	1	2	1	Ch,16
5	9. The basic equation of the MKT of ideal gases. Transfer phenomena. 10. Maxwell's law on the distribution of gas molecules by velocities and energies. Barometric formula (SIWT). Lab. 3- Determination of the viscosity of liquids by the Stokes method.	1	2	1	Ch.17-19
6	11. Fundamentals of thermodynamics. Isoprocesses. Adiabatic process. 12. Entropy. Thermal engines. Carnot cycle and its efficiency (SIWT). Lab. 4-Determination of the specific heat of crystallization (melting) and changes in entropy	1	2	1	Ch.20
7	3. Real gases, liquids and solids. Van der Waals equation. 14. Internal energy of real gas. Joul-Thomson effect. Liquefaction of gases (SIWT). Delivery of laboratory works (DLW2).	1	2	1	Ch.19,20

8	15. Electrostatics. Coulomb's law. Tension and potential of the electrostatic field. Gauss theorem. 16. Electrostatic field in a dielectric medium. Types of dielectrics. Ferroelectrics and their applications (SIWT) Delivery of laboratory works (DLW2).	1	2	1	Ch.21-23
9	17. Conductors in an electro-static field. Capacitors, their types and applications. 18. Direct electric current. Ohm's law. Work and current power (SIWT). Lab.5- Simulation of a plane-parallel electrostatic fields	1	2	1	Ch.24,25,27
10	19. Electric currents in metals, vacuum and gases. 20. Electric current in electrolytes. Laws of electrolysis. Applications (SRSP). Lab.6- Measurement of resistance and determination of the specific resistance of conductors	1	2	1	Ch.26
11	21. Electric current in gases. Gas discharges and their applications. 22. Electric current in vacuum. Emission Phenomena and Their Applications (EIS). Delivery of laboratory works (DLW3).	1	2	1	Ch.26
12	23. Magnetic field in vacuum mind. Laws of Biot-Savart-Laplace and Ampère. 24. Movement of charged particles in a magnetic field. Mass spectrometry. Accelerators of charged particles (SIWT). Lab.7- Study of the magnetic field on the axis of the coil.	1	2	1	Ch.28,29
13	25. Electromagnetic induction. Faraday's law. 26. Frame rotation in a magnetic field. The principle of operation of the generator and electric motor.	1	2	1	Ch.30

	Lab.8- Study of the Hall effect in semiconductors				
14	27. Loop inductance. Mutual induction. Transformers, their types and applications. 28. Magnetic properties of matter. Diamagnets and paramagnets. Their properties and applications (SRSP). Delivery of laboratory works (DLW4).	1	2	1	Ch.31-33
15	29. Magnetic properties of liquids and gases. Ferro-magnets and their applications. 30. Maxwell's system of equations for an electromagnetic field (SIWT). Delivery of laboratory works (DLW4	1	2	1	Ch.31,34

Teaching methodology

* The SWS tasks themselves, including the requirements for their implementation and evaluation criteria, are posted on the Intranet website. Lectures on the discipline are conducted using multimedia presentations that allow you to clearly structure the lecture material, save time spent on drawing diagrams on the board, writing formulas and other complex objects, and making it possible to increase the amount of material presented. Students are given the opportunity to copy presentations for self-study and exam preparation. **Lectures with the SIWT mark are worked out by students independently under the guidance of a teacher. The topics of lectures may vary slightly with the obligatory timely informing students.**

6. Course Requirements and Grades

Task types	Points
Individual homework (IHW)	20
Delivery of laboratory work (DLW)	20
Control works (KW)	10
(Mid Term)	10
Final exam (FE)	40
Total	**100**

COURSE ASSESSMENT PARAMETERS

№	Assessment criteria	Weeks																Total
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16 17	
1.	Attendance has to be more than 80%																	

2.	Individual homework (IHW)				*			*				*			*			20
3.	Delivery of laboratory work (DLW)				*			*	*			*			*	*		20
4	Control works (KW)							*							*			10
5	Mid Term (MT)								*									10
6.	Final examination																40	40
	Total	60															40	100

Grading policy: At the end of the semester, you receive an overall final grade based on the relevant INTRANET criteria, which is a cumulative indicator of your performance throughout the semester. It is possible to receive bonus points (no more than **6** points per semester: **3** points each after the 1st and 2nd attestations, respectively) for participation in olympiads, student scientific conferences, active participation in practical classes (**1p**), the presence of lecture notes and the absence of passes (**2p**), within the maximum number of points for each assessment. At the end of the semester, the student receives a final grade, which is a summary of the work performed throughout the semester. If this amount is less than **30** points, then the student is not allowed to take the final exam! The final grade will be given according to the grading system adopted in KBTU. **If the score for the final exam is less than 20 points, but 10 or more, then the final grade "FX" for the discipline is set, regardless of the number of points received during the semester, with the right to one retake! If the student scored less than 10 points, then the grade "F" is set, without the right to retake.**

Grade		Achievement percentage	Assessment criterion
«Excellent»	A	95-100%	This grade is given when the student: demonstrated a complete understanding of the course material; did not make any errors or inaccuracies; completed control and laboratory work in a timely and correct manner, and submitted reports on them; demonstrated original thinking; submitted control quizzes on time and without any errors; completed homework assignments; engaged in research work; independently used additional scientific literature in studying the discipline; was able to independently systematize the course material.
	A -	90-94%	
«Good»	B+	85-89%	This grade is given when the student: Has mastered the course material at no less than 75%; Did not make gross errors in responses; Timely completed control and laboratory work and submitted them without fundamental remarks;
	B	80-84%	

	B-	75-79%	Correctly completed and timely submitted control tests and homework assignments without fundamental remarks; Utilized additional literature as indicated by the instructor; Engaged in research work, made non-fundamental errors, and fundamental errors corrected by the student themselves; Managed to systematize the course material with the help of the instructor.
	C+	70-74%	
«Satisfactory»	C	65-69%	This grade is given when the student: Has mastered the course material no less than 50%; Required assistance from the instructor when completing control and laboratory work, homework assignments; Made inaccuracies and non-fundamental errors when submitting control tests; Did not demonstrate activity in research work, relied solely on the educational literature indicated by the instructor; Experienced more difficulty in systematizing the material.
	C-	60-64%	
	D+	55-59%	
	D	50-54%	

7. General Rules

Academic Integrity: When you put your name on a work, it is meant to be your own work. Otherwise, it's plagiarism. You must report borrowings in the appropriate format, citing sources of information used in your work. Direct citations should be marked with quotation marks and with a link to the page. Plagiarism is classified as cheating and will be judged according to KBTU policies and procedures. Cheating on exams and cheating on assignments is unacceptable and will be assessed in accordance with KBTU policies and procedures. Plagiarism, cheating and other forms of dishonest work are unacceptable (plagiarism includes lack of references when using printed and electronic materials, quotes, thoughts of other authors). Hints are not allowed during tests and exams.

Attendance policy: Lateness and absenteeism must be avoided. Cell phones must be turned off during class. Missing an exam without a valid reason deprives the student of the right to take it. **With 20% or more missed classes, the student is removed from the discipline with the mark "F (Fail)".** Respect other people's opinions and be tolerant in the team. Formulate your objections and additions in the correct form.

Students are recommended.

- Contact instructors with any questions related to the course.
- Make suggestions to improve the educational process.
- Keep track of your grades throughout the semester.

Course Instructor: **Umarov Farid Fakhrievich**

Approved by the meeting of the SMSaGT

Meeting number: 7

Date: «27»August 2024