Course title	Physics (ECTS 4/4)
Subject/module code	FIZ11204
Semester(s) in which the course is taught	1st and 2nd semesters
Assigned instructor	Axmedov Erkin Raxmonovich, dotsent
Language of instruction	Uzbek
Course type	Compulsory
Study workload (including independent study)	**Total workload – 240 hours** **Contact hours – 96** Lecture hours – 48 Laboratory hours – 24 Practical class hours – 24 **Independent study – 144 hours**
ECTS	8
Course aims and objectives / learning outcomes	**The main aim of teaching the "Physics" course is to develop students' ability to view natural phenomena and processes from a scientific perspective, and to demonstrate, on the basis of theoretical and experimental materials, the objectivity of physical laws and the possibility of understanding them.** **The objective of the course is to reveal the role and importance of science in human life and society by developing students' theoretical knowledge, practical skills, methodological approaches to phenomena and processes, and scientific worldview.** **Learning outcomes:** 1. Studies the essence of physical phenomena in nature and technology through the fundamental concepts of physics. 2. Calculates material and heat balances in technological cycles. 3. Can analyse methods for determining electrical conductivity and elastic moduli. 4. Develops the skills needed to create physical models for solving problems such as calculating nuclear reactions and can explain the differences between them.
Course content (topics)	**I. Main theoretical section (Lectures)** **Topic 1: Purpose and objectives of teaching the course. Fundamentals of kinematics.** **Topic 2: Dynamics of a material point. Forces in nature and their properties.** **Topic 3: Conservation laws in mechanics.** **Topic 4: Dynamics of rotational motion of a rigid body.** **Topic 5: Mechanical oscillations and mechanical waves.** **Topic 6: General properties of liquids and gases.** **Topic 7: Fundamentals of molecular kinetic theory and statistical physics.** **Topic 8: Fundamentals of thermodynamics. Reversible and irreversible processes. Real gases. Thermal properties of matter.** **Topic 9: Electrostatic field and its properties. Work done by electrostatic field forces. Potential.** **Topic 10: Dielectrics and conductors in an electrostatic field.** **Topic 11: Laws of direct electric current.** **Topic 12: Electric current in vacuum and in media.** **Topic 13: Electromagnetism. Magnetic field strength. Magnetic properties of materials.** **Topic 14: Current-carrying conductors in a magnetic field. Ampere and Lorentz forces.** **Topic 15: Electromagnetic induction. Mutual induction. Transformer.** **Topic 16: Electromagnetic oscillations and waves. Alternating**

current.

Topic 17: Laws of geometrical optics. Optical instruments.

Topic 18: Wave nature of light. Light interference. Light diffraction.

Topic 19: Dispersion of light and polarization of light.

Topic 20: Quantum nature of radiation. Elements of quantum optics. Theory of relativity.

Topic 21: Structure of the atom. Corpuscular-wave duality of microparticles.

Topic 22: Structure and properties of the atomic nucleus. Nuclear and high-energy physics.

Topic 23: Radiation and its effects on the human body. Natural and artificial radiation.

Topic 24: The modern physical picture of the Universe. Quantum mechanics.

II. Guidelines and recommendations for organizing laboratory classes.

In laboratory classes, students develop practical skills in measuring various parameters of physical processes, conducting experiments, calculating data, and constructing tables and graphs. The recommended topics are selected according to available opportunities and conditions.

Recommended topics for laboratory work:

1. Studying the laws of uniformly accelerated motion using Atwood's machine.
2. Determining the acceleration due to gravity using a physical pendulum.
3. Determining the moment of inertia of bodies using a Maxwell pendulum and verifying the law of conservation of energy.
4. Determining the coefficient of internal friction (viscosity) of a liquid using Stokes' method.
5. Determining the surface tension coefficient of a liquid by the drop method.
6. Determining the resistance of a conductor using a DC bridge.
7. Studying the measurement of the magnetic field of an induction coil without a magnetic core.
8. Studying electromagnetic oscillations.
9. Studying the focal length of a lens.
10. Determining the wavelength of monochromatic light using a diffraction grating.
11. Investigating the dependence of photocell current on illumination.
12. Studying Malus's law.

III. Guidelines and recommendations for practical classes.

The teacher's preparation for a practical class begins with studying the initial documents (curriculum, thematic plan, etc.) and ends with preparing the lesson plan. The teacher should have a clear understanding of the aims and objectives of the practical class and the amount of work each student is expected to complete.

Methodological guidelines are the teacher's principal methodological document when preparing and conducting practical classes.

The purpose of practical classes is to understand theory and acquire skills, develop the ability to apply them consciously in educational and professional activities, and confidently formulate one's own point of view.

Recommended practical topics:

1. Fundamentals of kinematics.
2. Fundamentals of dynamics. Rotational motion of rigid bodies.
3. Mechanical oscillations and waves.
4. Molecular physics and thermodynamics.

	5. Electrostatics. Coulomb's law. Electric field strength. Potential. Gauss's theorem. Capacitance. Capacitors. Energy of a charged conductor. 6. Basic laws of direct current. Ohm's law for a section of a circuit and for a complete circuit. 7. Magnetic field. Biot–Savart–Laplace law and its application to various conductors. Ampere force. Lorentz force. 8. Magnetic flux. Electromagnetic induction. Inductance. 9. Electromagnetic oscillations. Thomson formula. 10. Laws of geometrical optics. Photometry. 11. Light interference and diffraction. Polarization of light. Laws of thermal radiation. Quantum nature of light. Photoelectric effect. 12. Radioactivity. Mass defect. Binding energy of atomic nuclei. Radiation. **IV. Independent study and individual work.** Independent learning competencies help students develop themselves autonomously and improve the effectiveness of their professional activities. Students complete independent assignments on their mobile devices, under the teacher's guidance, in traditional or electronic format. **Topics recommended for independent study:** 1. 1. Inertial forces in non-inertial reference frames. 2. 2. Motion of a body with variable mass. 3. 3. Elements of the theory of relativity. 4. 4. Elements of relativistic dynamics. 5. 5. Kepler's laws. 6. 6. Transport phenomena: diffusion, thermal conductivity and viscosity. 7. 7. Phase transitions. 8. 8. Plasma: properties and applications. 9. 9. Local decrease of entropy in open systems. Dissipative structures. 10.10. Plasma: properties and applications. 11.11. Thermoelectric phenomena. 12.12. Classical and quantum Hall effects. 13.13. Superconductivity and its quantum-mechanical interpretation. 14.14. Semiconductor–semiconductor contact. 15.15. Types of fundamental interactions. Unified field theory. 16.16. Cosmic rays: sources, energy and chemical composition. 17.17. Interaction of cosmic rays with the Earth's atmosphere. Extensive air showers. 18.18. Origin and evolution of the Universe. The Big Bang and inflation theories. 19.19. Formation and evolution of stars. White dwarfs, neutron stars and black holes. 20.20. Beta decay. Beta-decay spectrum. Neutrino. 21.21. The problem of controlling thermonuclear fusion reactions. 22.22. Nanoelectronics materials. Quantum dots, wires and wells. 23.23. Methods of transmitting high-frequency signals. 24.24. Waveguides. 25.25. Structure and properties of nanoscale thin films. 26.26. Nanoscale clusters and crystals. Nanotechnology. 27.27. Spin electronics and its elements. 28.28. Liquid crystals and their properties. 29.29. The Large Hadron Collider and its operating principle. 30.30. Solar photovoltaic cells and modules.
Student assessment	Student assessment is based on the level of mastery of the learning materials during the semester and final assessment (tests, assignments, and written and oral work).

	Throughout the Physics course, students are assessed on a 100-point scale. Of this total, 50 points are allocated to current and midterm assessment (60% of these 50 points for ongoing assessment and independent study, and 40% for the midterm assessment), while 50 points are allocated to the final assessment. Students whose combined current and midterm score is below 30 points are not admitted to the final examination. A student who obtains 30 or more points in the final assessment is considered to have passed the course.
Examination requirements	The student must have fully mastered the theoretical and practical concepts related to the topic and be able to present the results of analysis correctly. The student must complete the assignments given as part of independent work and the current and midterm assessment. In addition, within the specified period, the student must obtain the required scores in current assessment, midterm assessment, independent study and the final assessment. Students who do not submit current assessment, midterm assessment and independent study assignments, or who score fewer than 30 points for these assignments and assessment components, are not admitted to the final assessment. Furthermore, a student who, without a valid reason, misses 25 percent or more of the contact hours allocated to the course will be withdrawn from the course, will not be admitted to the final examination, and will be considered not to have earned the relevant credits for the course. A student who fails the final examination or receives a score in the range of "0–29.9" for this examination is considered to have an academic debt.
Recommended literature	**Main literature:** 1. Abdumalikov A.A., Sattorov H.M. Mexanika. O‘quv qo‘llanma. Toshkent: Donishmand ziyosi, 2020-yil. 2. Abduraxmonov A. Mexanika va molekulyar fizika. Darslik. "JizPI tipografiyasi", Jizzax 2023 -yil. 3. Abduraxmonov A. Fizika.1 O‘quv qo‘llanma "JizPI tipografiyasi" Jizzax 2025- yil 4. Orifjonov Elektromagnitizm. O‘quv qo‘llanma. Toshkent: Cho‘lpon nashryoti, 2011-yil 5. Mustafakulov A.A. Elektr texnik materiallar. Darslik. "JizPI tipografiyasi" 2022-yil. 200 b. 6. Abdumalikov A.A. Elektrodinamika. Darslik.:Cho‘lpon nashryoti, Toshkent, 2011-yil 7. Yuldashev B.S., Polvonov S.R., Bozorov E.X. Amaliy yadro fizikasi. Darslik.- Toshkent: Donishmand ziyosi, 2020-yil 8. Polvonov S., Bozorov E., Kanolov Z. Atom yadrosi va elementar zarrachalar fizikasi. O‘quv qo‘llanma. Toshkent: Go to print, 2020-yil 9. Mustafakulov A.A., Eshbekova S.O., Jo‘rayeva N.M. va b. Umumiy fizikadan amaliy mashgulotlar uchun o‘quv qo‘llanma. Innovatsion rivojlanish nashryot-matbaa uyi, 2019 yil-248 b. 10. Abdumalikov A.A., Sattorov H.M. Mexanika. O‘quv qo‘llanma. Toshkent: Donishmand ziyosi, 2020-yil **Additional literature** 11. Mirziyoyev Sh.M. 2019 - 2030-yillar davrida O‘zbekiston Respublikasining "yashil" iqtisodiyotga o‘tish strategiyasini tasdiqlash to‘g‘risidagi O‘zbekiston Respublikasi Prezidentining qarori, 04.10.2019 yildagi PQ-4477-son. 12. O‘zbekiston Respublkasini yanada rivojlantirish bo‘yicha Harakatlar strategiyasi to‘g‘risida. - T.:2017 -yil 7 fevral, PF-4947-sonli Farmoni.. 13. Begmatova D.A., Abdullayev R.M. Fizika.O‘quv–uslubiy qo‘llanma. T: Tafakkur avlodi, 2020- yil.

14. Yusupov D.B., Kamolxo‘jaev Sh.M., Gaibov A.G., Uzoqov A.A. Fizika fanidan laboratoriya ishlari uchun uslubiy ko‘rsatma .- T: ToshDTU, 2015- yil
15. Mirtadjieva K.T., Axunov T.A., Karabayeva M.A. Mexanika va molekulyar fizika. O‘quv qo‘llanma.-T: , Go To Print, 2020- yil.
16. Polvonov S.R., Daliyev X.S., Bozorov E.X., Palvanova G.S. Umumiy fizikadan masalalar to‘plami. - T: Ijod- Pres, 2019-yil
17. Mustafakulov A.A., Juraeva N.M., Axmadjonova U.T. Fizika fanidan laboratoriya ishlari. O‘quv qo‘llanma. Jizzax. Go‘zal print tipografiyasi”.2022-yil. 266 b.

Internet resources

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19. https://stellarium-web.org/
20. https://www.labcenter.com/.
21. https://www.multisim.com/
22. https://chatgpt.com/