Name of subject	Physics (ECTS 6/4)
Subject/module code	FIZ11210
Science taught semester (s).	1th and 2th semester
Responsible teacher	Mustafakulov Asror Axmedovich professor
Education language	Uzbek
Study to the program connection	Compulsory
Training hours (this including independent education)	**Total hours-300.** **Audience Training hours - 120.** Lecture training hour – 60 Laboratory training hour – 30 Practical training hour – 30 **Independent education -120 hours**
ECTS	10
The purpose and tasks of subject / learning outcomes	**The purpose of teaching science -** the main goal of teaching the "Physics" course is to form in students a culture of looking at phenomena and processes in nature from a scientific perspective, as well as to prove the objectivity and possibility of mastering physical laws based on theoretical and experimental materials. **The task of science is to** reveal the role and importance of science in human life and society by providing students with theoretical knowledge, practical skills, a methodological approach to financial phenomena and processes, and a scientific worldview. **Learning outcomes:** 1. Physics studies the essence of physical phenomena in nature and technology through fundamental concepts in physics 2. Calculates the balance of matter and heat in technological cycles 3. Able to analyze the determination of electrical conductivity and elastic modulus 4. Formulates studies on creating a physical model of nuclear reactions to solve problems such as calculating them and explains the difference between them
Course content (topics)	**I. Main Theoretical Part (Lecture Sessions)** **Topic 1:** Teaching and goals of physics. Fundamentals of kinematics. **Topic 2:** Dynamics of a material point. Forces in nature and their properties. **Topic 3:** Conservation laws in mechanics. **Topic 4:** Mechanical vibrations and mechanical waves. **Topic 5:** General properties of liquids and gases. **Topic 6:** Fundamentals of molecular kinetic theory. **Topic 7:** Fundamentals of thermodynamics. **Topic 8:** Electrostatic field and its properties. **Topic 9:** Work done by electrostatic field forces. Potential. **Topic 10:** Dielectrics and conductors in an electrostatic field. **Topic 11:** The laws of electric current. **Topic 12:** Electric current in various media. **Topic 13:** Electric current in metals and semiconductors. Types of electrical measuring instruments and their structure **14-Topic:** Electric current in gases and in a vacuum. **15-Topic:** Electrical engineering materials. Alternative energy sources. Electric machines and their types **Topic 16:** Electromagnetism. Magnetic field strength. **Topic 17:** Magnetic properties of substances. **Topic 18:** types of magnets. ferromagnets **Topic 19:** Magnetic field of electric current. Current-carrying conductors in a magnetic field.

Topic 20: The phenomenon of electromagnetic induction.

Topic 21: Mutual induction. Alternating current. Transformer.

Topic 22: Electromagnetic oscillations and waves.

Topic 23: Laws of geometric optics.

Topic 24: The wave nature of light. Interference of light. Diffraction of light.

Topic 25 Dispersion and polarization of light.

Topic 26 Laws of thermal radiation. Quantum nature of light. Elements of quantum optics.

Topic 27 Atomic structure. Corpuscular-wave dualism of microparticles.

Topic 28 Bohr theory of the hydrogen atom.

Topic 29 Structure and properties of the atomic nucleus.

Topic 30 Modern physical picture of the universe.

II. Instructions and recommendations for organizing laboratory exercises.

During laboratory sessions, students develop practical skills and competencies in measuring various parameters of physical processes, conducting experiments, performing calculations, and drawing tables and graphs. The recommended topics are selected based on available opportunities and conditions.

Recommended topics for laboratory work:

1. Determination of the acceleration due to gravity using the ring vibration method.
2. Determination of the acceleration of free fall using a physical pendulum.
3. Determination of the moment of inertia of a body using a dynamic method.
4. Determination of the moment of inertia of bodies using Maxwell's pendulum and verification of the law of conservation of energy.
5. Determination of the coefficient of internal friction of a liquid using the Stokes method.
6. Determination of the specific heat capacity of bodies by mixing
7. Study of gas laws. Dependence of gas pressure on volume at constant temperature. (Boyle-Mariotte law)
8. Determination of the resistance of a conductor using a constant current bridge
9. Study of the magnetic field of a straight conductor and a rotating ring
10. Study of measuring the magnetic field of an inductive coil without a magnetic core
11. Determination of the capacitance of a capacitor.
12. Determination of the focal length of a lens.
13. Determination of the wavelength of monochromatic light using a diffraction grating.
14. Checking the dependence of the photocell current on the angle of illumination and distance. Checking the dependence of the photocell current on illumination.
15. Study of Malus's law.

III. Practical training instructions and recommendations

The teacher's preparation for a practical training session begins with the study of preliminary documents (curriculum, thematic plan, etc.) and ends with the development of a lesson plan. The teacher should have an idea of the goals and objectives of the practical training session, the amount of work that each student must perform.

Methodological guidelines are the main methodological document of the teacher in preparing and conducting practical training sessions.

The purpose of the practical training session is to understand the

theory, acquire skills. It is to consciously apply it in educational and professional activities, and to develop the ability to confidently form one's own point of view.

The following topics are recommended for practical training:

1. Fundamentals of kinematics
2. Fundamentals of dynamics
3. Rotary motion of solids.
4. Mechanical vibrations and waves.
5. Molecular physics and thermodynamics.
6. Electrostatics. Coulomb's law. Electric field strength and potential. Capacitance, capacitors.
7. Basic laws of direct current. Ohm's law for a part of a circuit and a complete circuit. Kirchhoff's rules. Work and power of current. Joule - Lens law
8. Magnetic field. Biot-Savart-Laplace law and its application to various conductors.
9. Current-carrying conductor in a magnetic field. Ampere force. Lorentz force.
10. Parameters of power devices. Magnetic flux. Electromagnetic induction. Inductance
11. Electromagnetic oscillations. Thomson's formula.
12. Laws of geometric optics. Photometry.
13. Interference of light. Diffraction of light. Polarization of light. Use of light energy.
14. Laws of thermal radiation. Quantum nature of light. Photoelectric effect.
15. Radioactivity. Mass defect. Binding energy of atomic nuclei.

IV. Independent learning and independent work.

Independent learning competence serves to support students' independent self-development and increase the effectiveness of professional activities. Students perform independent work on their mobile devices under the guidance of a teacher in a traditional or electronic form.

Recommended topics for independent study:

1. Fundamentals of Kinematics
2. Scientific discoveries of Uzbek thinkers - A.R. Beruni, Ibn Sina, M. Ulugbek, Abu Nasr Farobi, Al-Khwarizmi and others, their great contribution to world civilization.
3. Measurement of physical quantities. Types of errors.
4. Elements of kinematics.
5. Forces and conservation laws in nature
6. Kepler's laws.
7. The law of conservation and circulation of energy.
8. The motion of planets and satellites. Cosmic velocities.
9. Forces in nature. Frictional, elastic forces.
10. Dynamics of rotational motion of rigid bodies
11. Moment of inertia of bodies of various geometric shapes.
12. Mechanical vibrations and waves.
13. Pendulums and their types and applications.
14. Fluid and Gas Mechanics
15. Viscous Fluid Hydrodynamics.
16. Air Humidity. Saturated and Unsaturated Vapors.
17. Solids. Crystalline and Amorphous Bodies.
18. Surface Tension. Wetting and Non-Wetting. Capillary Phenomena.
19. Fundamentals of molecular physics and thermodynamics
20. Clapeyron-Mendeleev equation. Universal gas constant.
21. The basic equation of the molecular-kinetic theory of gases

	22. Application of the first law of thermodynamics to isoprocesses. 23. Reversible and irreversible processes. Carnot cycle. 24. Van der Waals equation and isotherms. Internal energy of a real gas. 25. Migration phenomena. Diffusion, thermal conductivity and viscosity. 26. Energy. Electrostatics 27. The basic law of electrostatics - Coulomb's law. 28. Piezoelectrics, ferroelectrics and their application in technology. 29. Capacitor and its types. 30. Structure and operating principles of modern power devices. 31. Laws of constant current 32. Types of electric heating devices and their applications. 33. Kirchhoff's rules. Connecting conductors. 34. Electrolysis. Faraday's laws for electrolysis. 35. Determining the electrochemical equivalent of copper. 36. Types of independent gas discharges and their applications. 37. Plasma. Properties and applications. 38. Thermoelectric phenomena. 39. Alternative energy sources and their production. 40. Electromagnetism 41. Application of the Biot-Savart-Laplace law to various current circuits. 42. Types of magnets. Diamagnets. Paramagnets. 43. The phenomenon of electromagnetic induction and Faraday's experiments. 44. Transformers and their types, principle of operation. 45. Ferromagnets and the phenomenon of hysteresis. 46. Resistance, capacitance and inductance in an alternating current circuit. 47. Alternating current power. Power factor. 48. Electromagnetic oscillation circuit. Thomson's formula. 49. Electrical measuring instruments and their structure. 50. Laws of geometric optics 51. Lenses and their types. Image formation in a lens. 52. The principle of holography and its application. 53. Eye-optical system. Spectral sensitivity of the eye. 54. Methods of observing light interference. Interferometers. 55. Fiber optic systems 56. Elements of quantum optics 57. X-rays and their applications. 58. Laws of blackbody radiation. 59. Einstein equation for the external photoelectric effect. 60. Areas of application of lasers. 61. Chemical effects of light, photosynthesis 62. Atomic and nuclear physics 63. Atomic structure. Bohr postulates. 64. Quantum numbers and their meaning. Spin quantum number. Pauli principle. 65. Beta decay. Beta decay spectrum. Neutrino. 66. The problem of controlling thermonuclear fusion reactions. 67. Atomic energy and work in Uzbekistan. 68. Radioactivity, its types. Radiation dose. 69. Types of fundamental interactions. Unified field theory. 70. Methods of recording and observing charged particles. 71. The origin and evolution of the universe. Theories of the big bang and inflation. 72. Modern physics and its achievements

	73. Physics and the scientific and technological revolution. 74. Nanoelectronic materials. 75. Liquid crystals and their properties. 76. Modern energy devices
Student assessment	Assessment of student knowledge is based on the mastery of teaching materials during the semester and during the final control (test, assignment, written and oral work results). During the course, students are assessed on a 5-point system (electronic platform 100 points). The electronic platform is 100 points - of which 50 points are allocated for current control, independent study and intermediate control (60% of 50 points are JN, MT and 40% ON), and 50 points are allocated for the final control result. Students with a total score of current and intermediate points below 30 points are not admitted to the final control exam. A student who scores 30 or more points in the final control is considered to have mastered the subject.
Requirements for exams	The student must have fully mastered the theoretical and practical concepts of the subject, be able to correctly reflect the results of the analysis. The student must have completed the tasks given in the current and intermediate forms of independent work, assessment. At the same time, he must have received the necessary points from the current, intermediate, independent education and final tests in the relevant subject within the specified time. A student who has not submitted current control, intermediate control and independent education tasks, as well as who has scored less than 30 points on these tasks and types of control, will not be included in the final type of control. Also, a student who has missed 25 or more percent of the classroom hours allocated to the subject without an excuse will be expelled from this subject, will not be allowed to take the final exam and will be considered as not having mastered the relevant credits in this subject. A student who fails the final exam or scores less than 30 points on this type of exam is considered academically indebted.
Recommended Literature	**Main literature:** 1. Douglas C. Giancoli, Physics: Principles with Applications, Prentice Hall; 6th edition January 17, 2004 USA. 2. Raymond A. Serway, John W. Physics for Scientists and Engineers with Modern Physics, Cengage Learning; 9. 2013, Brooks/cole 20 Channel Center Street Boston, MA 02210 USA. 3. Sultanov N. Physics course. Textbook, T: Science and Technology, 2007. 4. B. Izbosarov, I. Kamolov Molecular physics and thermodynamics basics, Tashkent, 2018. 5. Orifjonov Electromagnetism. Textbook. T: Publisher, 2011. 6. Izbosarov B.F., Kamolov I.R. Electromagnetism. Textbook, T: Economics-Finance, 2006. 7. Trofimova T.I. Physics course. Textbook -M.: "Academy", 2007. 8. 8. Detlaf A.A., Yavorsky B.M., Physics Course. Textbook -M.: "Academy", 2007. 9. Kadirov O. Physics Course. (Mechanics, molecular physics), Part 1. T: Science and Technology, 2005. 10. Mamatkulov R., Tursunov A.A. Mamatkulov B.R. Problems of Thermodynamics and Statistical Physics, Textbook. T: Uzbekistan, 2003. Otaqulov B.O., Pulatov Yu.P., Khalilov N.A., G`oziev Z.A. Physics (Department of Mechanics), Textbook. Tashkent-2004. 11. Kadirov O., Boydedayev A. Physics course. Part-3: Quantum physics – T: Uzbekistan, 2005.

12. Ismoilov M., Khabibullaev P.K., Khaliulin M. Physics course. Textbook, T: Uzbekistan, 2000.
13. Abdumalikov A.A., Sattorov H.M. Mechanics. Textbook. T: Donishmand ziyosi, 2020.
14. Abdurakhmonov K.P., Egamov O. Physics course. Textbook – Tashkent, 2010.
15. Nazarov O.Q. General physics course part 2. Electricity and magnetism. Textbook. T: Uzbekistan, 2002.
16. Tursunov I.G., Begmatova D.A. Physics. Textbook – methodological manual. T: Tafakkur bo`stoni, 2018.
17. Turgunov T. Applied physics. Textbook. T: Uzbekistan, 2003.
18. 18. Toshkhonova J.A., Olmasova M.H., Ismoilov I., Rizayev T., Makhmudova X.M. Physics practical (Mechanics and molecular physics). T: National Publishing House of Philosophers of Uzbekistan. 2006.
19. Toshkhonova J.A., Olmasova M.H., Ismoilov I., Rizayev T., Makhmudova X.M. Physics practical. (optics) T: National Publishing House of Philosophers of Uzbekistan.2006 p. 31.
20. Izbosarov B.F., Kamolov I.R. Laboratory work on general physics, T: Voris , 2007.
21. Otakuziev B., Pu'latov Yu.and b. Physics. Department of Mechanics , Tashkent, 2004.
22. Mustafakulov A.A., Eshbekova S.O., Djuraeva N.M. and b. Textbook for practical exercises in general physics. Innovative Development Publishing House, 2019-248 p.
23. Mustafakulov A.A., Djuraeva N.M., Akhmadjonova U.T. Laboratory work on physics. Textbook. 2022.
24. Mamatkulov B.Kh. Optics. Textbook: Jizzak "SANGZOR - PRINT" 2021g.109 p.
25. Mamatkulov B.Kh. The course is physical (often second). Uchebnik. Izdatelstvo "SANGZOR - PRINT", 2022g, 492 str.
26. Khairiddinov B., Zorayev Sh. Molecular physics, Tashkent, 2013 Akhmadjonov O. Physics course. Textbook, 1-3 q.-T., "Teacher", 1999.
27. Kamolov J., Ismailov I. and others Electricity and magnetism. Electricity and magnetism. Textbook, Economics-Finance, 2007.
28. Volkenstein VS. Collection of problems from the general physics course. T.: Teacher, 1996.
29. Chertov A., Vorobev A. Collection of problems from physics. Textbook-T.: Uzbekistan, 1997.
30. Begmatova D.A., Abdullayev R.M. Physics. Educational and methodological manual. T: Tafakkur Avlody, 2020.
31. Polvonov S., Bozorov E., Kanolov Z. Physics of the atomic nucleus and elementary particles. Textbook. T: Go to print, 2020.

Additional literatures

32. Mirziyoyev Sh.M. Resolution of the President of the Republic of Uzbekistan on approval of the Strategy of the transition of the Republic of Uzbekistan to a “green” economy for the period 2019 — 2030, No. PQ-4477 dated 04.10.2019.
33. Mirziyoyev Sh.M. Critical analysis, strict discipline and personal responsibility should be the daily rule of every leader. Speech of the President of the Republic of Uzbekistan at the meeting of the Cabinet of Ministers of the Republic of Uzbekistan dedicated to the results of 2016 and prospects for 2017. //"Xalq so'zi" newspaper. 2017, January 16, No. 11.
34. Constitution of the Republic of Uzbekistan. - T.: Uzbekistan, 2017. - 46 p.

35. On the Strategy of Actions for the Further Development of the Republic of Uzbekistan. - T.: Decree No. PF-4947 of February 7, 2017.
36. Mirtadjieva K.T., Akhunov T.A., Karabayeva M.A. Mechanics and Molecular Physics. Textbook.-T: , Go To Print, 2020.
37. Abdumalikov A.A. Elektrodinamika. Darslik-T.:Cho`lpon, 2011.
38. Yusupov D.B., Kamolkhozhaev Sh.M., Gaibov A.G., Uzoqov A.A. Methodical instructions for laboratory work in physics. - T: ToshDTU, 2015.
39. Polvonov S.R., Daliyev X.S., Bozorov E.Kh., Palvanova G.S. Collection of problems in general physics. - T: Ijod- Press, 2019.
40. Yuldashev U., Sultanov M.U. Problems of neutron and nuclear physics. Textbook. - T: Lesson press, 2021.
41. Sodiqova Sh., Otajonov Sh., Kurbanov M. Lasers and their role in practice. Textbook. Tashkent-2020.
42. Yuldashev B.S., Polvonov S.R., Bozorov E.Kh. Practical nuclear physics. Textbook. -T: Donishmand ziyasi, 2020.
43. Teshaboyev A.T. Physics, chemistry and technologies of nanoparticles. Textbook. T: Tafakkur bo`stoni, 2014.
44. Normuradov M.T., Umirzakov B.E., Tashatov A.Q. Fundamentals of Nanotechnology. Textbook. T: NIF MSh, 2020.
45. 12. Qosimov A., Jurakulov Kh., Safarov A. Physics course. Mechanics. Part 1. Uzbekistan, Tashkent, 1994.
46. Mominov A.E., Yuldashev U., Mustafakulov A. A manual for performing laboratory work in general physics. Jizzakh 2003.
47. Mustafakulov A.A. and others “Electrical engineering materials”. “Turon-Iqbol” publishing house, Tashkent-2015.
48. Sattarov S.A., Mustafakulov A.A. and others. “Alternative energy sources”, “Textbook for students of the bachelor's degree in electronics and instrumentation (in the electronics industry), JizPI publishing house, 233 p.
49. Djuraeva N.M., Akhmadjonova U.T. Methodical manual for laboratory work in physics (part 1). 2023
50. Abdurakhmonov A. Mechanics and molecular physics. Textbook. “JizPI typography”, Jizzakh 2023.
51. Kulboyev Z., Urinov Sh. Mechanics and molecular physics. Textbook. “JizPI typography”, Jizzakh 2023.
52. Rakhimov O., Khalilov O. Physics in construction. Textbook “JizPI typography”, Jizzakh 2023.
53. Akhmedov E., Abdurakhmonov A. Electricity and magnetism. Textbook. “JizPI typography”, Jizzakh 2023.Internet manbalar:

Internet resources:

54. www.ziyonet.uz – milliy o‘quv materiallarini qidiruv sayti.
55. www.gov.uz – O‘zbekiston Respublikasining hukumat portali.
56. www.google.com – xalqaro o‘quv materiallarini qidiruv sayti.
57. www.energystrategy.ru – “Energetika siyosati va strategiyasi” axborot portali
58. www.twirpx.com – xalqaro o‘quv materiallarini qidiruv sayti.