Національний технічний університет України
«КИЇВСЬКИЙ ПОЛІТЕХНІЧНИЙ ІНСТИТУТ
імені ІГОРЯ СІКОРСЬКОГО»

Department of General Physics

GENERAL PHYSICS 1

Working program of the academic discipline (Syllabus)

Details of the academic discipline	
Level of higher education	***First (undergraduate)*** *14*
Field of	*Electrical engineering*
knowledge	*141 Power engineering, electrical engineering and electromechanics*
Specialty Educational program	*Electromechanical automation systems, electric drive and electric mobility*
Status of the	*Normative*
discipline Form of	*Daytime*
study Year of training,	*1st year, autumn and spring semester*
semester Scope of	*5.5 credits*
the discipline Semester control/ control measures	*Exam / MKR, RGR*
Class schedule	*The time and place of classroom classes are listed on the website http:// rozklad.kpi.ua/*
Language of	*Ukrainian*
instruction Information about the course leader / teachers	Lecturer: *Art. off Samar Anna Volodymyrivna, anna.samar@gmail.com, 0679189012* Practical: *art. off Samar Anna Volodymyrivna, anna.samar@gmail.com, 0679189012* Laboratory work: *Art. off Samar Anna Volodymyrivna, anna.samar@gmail.com, 0679189012; assistant Eduard Vasylovich Lukyanenko, eduardlukianenko@gmail.com, 0977345910*
Placement of the course	*CAMPUS, Platform Sikorsky ("General Physics")*

Program of educational discipline

1. Description of the educational discipline, its purpose, subject of study and learning outcomes

The purpose of the educational discipline is to form and consolidate the acquirers' competencies, skills and abilities regarding the use of basic physical laws and research methods when studying engineering and professional disciplines and solving engineering problems.

The subject of the academic discipline is matter and the most general forms of its existence, movements and fundamental interactions that control the movement of matter, as well as the laws, methods and means of physics as components of the research process.

The discipline "General physics" belongs to the disciplines of the cycle of general training and is studied by students in the 1st and 2nd semesters of study in the specialty 141 Electric power engineering, electrical engineering and electromechanics. This discipline contributes to the formation of students' basic concepts, abilities and skills regarding the processes, phenomena and laws of physics. In particular,

ABILITY:

- *combine the physical essence of natural phenomena with analytical relationships that describe these phenomena;*

• *connect the macroscopic description of phenomena with their microscopic mechanisms;*
• *correctly assess the limits of applicability of physical laws and principles the possibility of certain phenomena;*

After mastering the academic discipline, students must demonstrate the following learning outcomes:

KNOWLEDGE:

• *fundamental concepts, laws and theories of classical and modern physics;*
• *conceptual approaches to the study of physical phenomena;*
• *basics of classical mechanics;*
• *basics of molecular physics and thermodynamics;*
• *basics of electricity and magnetism;*
• *fundamentals of oscillatory and wave processes;*
• *fundamentals of quantum, atomic and nuclear physics;*
• *methods of solving physics problems.*

SKILLS:

• *analyze educational and educational and methodological literature, use it in the educational process;*
• *determine the optimal methodology for solving problems and setting up experiments in physics;*
• *analyze and interpret the obtained results of problem solving;*
• *analyze the results of observations and experiments using the basic laws of physics, use physical devices*
• *find connections and make marginal transitions from the obtained results to known data obtained from simpler models;*
• *present the material logically and consistently, substantiate their statements.*

Program learning outcomes.

Competencies:

K01. Ability to abstract thinking, analysis and synthesis.
K02. Ability to apply knowledge in practical situations.
K05. Ability to make informed decisions.
K06. Ability to identify, pose and solve problems.
K07. Ability to work in a team.
K08. Ability to work autonomously.
K12. The ability to solve practical problems involving the methods of mathematics, physics and electrical engineering.
K20. The ability to apply new technologies in electric power, electrical engineering and electromechanics.

Program learning outcomes:

PR 3. To know the principles of operation of electric machines, devices and automated ones electric drives and be able to use them to solve practical problems in professional activities

PR 5. Know the basics of electromagnetic field theory, methods of calculating electric circuits and be able to use them to solve practical problems in professional activities.

PR 08. Choose and apply suitable methods for the analysis and synthesis of electromechanical and electric power systems with specified indicators.

PR 10. Find the necessary information in scientific and technical literature, databases and other sources of information, evaluate its relevance and reliability.

PR 18. To be able to learn independently, acquire new knowledge and improve the skills of working with modern equipment and measuring equipment.

2. Pre-requisites and post-requisites of the discipline (place in the structural and logical scheme of training according to corresponding educational program)

The discipline "General physics" belongs to the disciplines of the cycle of natural and scientific training, its study is based on knowledge of physics and mathematics according to the secondary school program. The knowledge obtained during the study of the general physics course is used in the study of the following disciplines: "technical mechanics", "theoretical foundations of electrical engineering", "electric machines", "electromechanical materials", "electrical systems and networks", "fundamentals of metrology and electrical measurements", "ecology" and courses of other disciplines of the cycle of professional and practical training.

3. Content of the academic discipline

Credit module 1.

Chapter 1. Physical foundations of mechanics.

1.1. Elements of kinematics.

1.2. Dynamics of a material point.

1.3. Law of conservation of momentum.

1.4. Law of conservation of energy.

1.5. Dynamics of rotational motion of a rigid body.

1.6. The law of conservation of momentum.

1.7. The principle of relativity in mechanics.

1.8. Special theory of relativity.

1.9. Elements of relativistic dynamics.

1.10. Elements of mechanics of continuous media.

Chapter 2. Fundamentals of molecular physics and thermodynamics.

2.1. Thermodynamic and molecular-kinetic approaches in the study of thermal properties of bodies (systems).

2.2. The second law (second law) of thermodynamics.

2.3. Transference phenomena.

2.4. Real gases.

2.5. liquids

2.6. Phase equilibria and transformations.

2.7. Solid body.

Chapter 3. Electricity and magnetism.

3.1. Electrostatic field in vacuum.

3.2. A dielectric in an electrostatic field.

3.3. Conductors in an electrostatic field. 3.4. Electric field
energy. 3.5. Direct current. ***Credit module***
2.

Chapter 3. Electricity and magnetism (continued). *3.6. The*
magnetic field of direct currents in a vacuum. 3.7. Electromagnetic
induction. 3.8. Magnetic field in matter.
3.9. Maxwell's equation. Electromagnetic
field.

Chapter 4. Oscillations and waves.

4.1. Oscillating motion. 4.2.
Wave processes.

Chapter 5. Wave and quantum optics.

5.1. The electromagnetic nature of light. 5.2.
Interference of light. 5.3. Diffraction
of light. 5.4. Polarization of
light. 5.5. Dispersion of light.
5.6. Quantum nature of
radiation. 5.7. Phenomena related to the corpuscular
properties of light.

Chapter 6. Elements of atomic physics and quantum mechanics *6.1.*
Bohr's theory of the structure of the atom.
6.2. Elements of quantum mechanics.

Chapter 7. Elements of the physics of the atomic nucleus and elementary particles.

7.1. Core structure. Nuclear reactions.
7.2. Elementary particles. A list of
sections and topics of the entire ***discipline is provided.***

4. Educational materials and resources

Basic literature

1. Kucheruk I.M., Gorbachuk I.T., Lutsyk P.P. General course of physics. T.1 Mechanics.
Molecular physics and thermodynamics. - K.: Technika, 2004.
2. Kucheruk I.M., Gorbachuk I.T., Lutsyk P.P. General course of physics. T.2 Electricity
and magnetism. - K.: Technika, 2004.
3. Kucheruk I.M., Gorbachuk I.T., Lutsyk P.P. General course of physics. T.3 Optics.
Quantum physics. - K.: Technika, 2004.
4. Physics (Physics for engineers): Textbook / I.F. Skitsko, O.I Skitsko: Kyiv: Ihor Sikorsky National Technical University of Ukraine, 2017. 513 p.
5. Basic guide Bratus T.I., Samar G.V. Electrostatics and laws of direct current. Tasks and recommendations for the performance of control work No. 3. 2018 – K: KPI, 2018.

Supporting literature

6. General course of physics. Collection of problems. / under the editorship Prof. Harkushi I.P./ - K: Technology,

2003.

7. Cherkashin V.P. Methodical instructions for laboratory works in physics / electricity

and magnetism/ ch.h. 1, 2 – K: KPI, 2000.

8. Methodical instructions for laboratory works in physics. Molecular physics. – To:

KPI, 2014.

9. Landsberg G.S. Optics. - M.: FML, 2003.

Wenger E.F., Hryban V.M., Melnychuk O.V. Fundamentals of quantum mechanics. Study guide. - K: Higher School, 2002.

10. White M.U. , Okhrimenko B.A. - Atomic physics. - K: Znannia, 2009.

Information resources:

1. Electronic campus of KPI named after Igor Sikorskyi, methodical support for the credit module "General Physics".

2. "Sikorskyi" platform, distance course "General Physics"

3. Online library of Igor Sikorsky KPI https:// ela.kpi.ua/

Recommendations and clarifications:

- *the textbooks specified in the list can be obtained in the library of KPI named after Igor Sikorskyi (subscription or reading room), on the Internet on the page of the Department of General Physics kzf.kpi.ua*
- *the student should use the given materials for independent preparation for practical, laboratory classes and writing MKR;*
- *for independent work on the Sikorsky platform, the synopsis of the lectures is posted accordingly to the topics being studied.*
- *Methodical instructions, protocols for laboratory works can be found in the classroom on the Sikorsky platform and on the website https:// kzf.kpi.ua/ laboratornyj-praktykum/*

Educational content

5. Methods of mastering an educational discipline (educational component)

The educational part of the discipline consists of lecture material, practical classes and control measures in the form of MKR. The material is divided into thematic components according to the order of study. Each such part is structured according to the types of activities necessary to master the subject: theoretical part (lectures, video materials), practical part (methodical guides for solving problems, examples of solutions, tasks for independent work), laboratory practice (work protocols, video materials, reference information, tasks for independent work). Thus, a comprehensive approach to the study of individual topics and the subject as a whole is provided. And also provides a general methodical approach to the teaching of the academic discipline as communicative-cognitive and professionally-oriented, according to which the student is at the center of the educational process -

subject of study and future specialist.

Lecture classes

No s/p	Name topics lectures and list the main ones questions (a list of didactic tools, references to the literature and tasks on the SRS)
1.	Section 1. Topic 1.1. Elements of kinematics. Physical models: material point, absolutely solid body. Space and time. Kinematic description of movement. Rectilinear movement of a material point. Movement of a point in a circle. Velocity as the time derivative of the radius vector. The radius of curvature of the trajectory. Acceleration during curvilinear movement. Normal and tangential acceleration. Elements of solid body kinematics. Progressive motion of a rigid body. Rotation of a rigid body around a fixed axis. Angular movement. Pseudovector **dÿ,** axial vectors, angular velocity and angular acceleration, relationship between linear and angular displacements, velocities and accelerations of points of a rotating solid. [1] vol. 1, §§ 1.1-1.6
2.	Chapter 1. Topic 1.2. Dynamics of a material point. Basic laws of dynamics. Concept of state in classical mechanics. The law of inertia and inertial frames of reference. System of material points. External and internal forces. Closed system. Body mass and momentum. Force field. Newton's laws. Non-inertial frames of reference. Inertia forces. [1] vol. 1, § 2.1-2.7.
3.	Chapter 1. Topic 1. Law of conservation of momentum. The law of conservation of momentum as one of the fundamental laws of nature. Center of inertia (center of mass), additivity of mass. Theorem about the movement of the center of mass. Movement of a body with variable mass. Jet motion. [1] vol. 1, § 2.8.
4.	Chapter 1. Topic 1.4. Work, energy, power. Laws of conservation of energy. Law of conservation of energy. Work. Power. Kinetic energy. Conservative and dissipative forces. Potential field. Potential energy of a body in a gravitational field. A potential pit. Potential energy. Connection of force and potential energy. The law of conservation of energy of a mechanical system. In general the physical law of conservation of energy. Collision of absolutely elastic and inelastic bodies. [1] vol. 1, § 3.1-3.7.
5.	Chapter 1. Topic 1.5. Dynamics of rotational motion of a rigid body. Kinetic energy of a rigid body that rotates around a fixed axis. Moment of inertia relative to a fixed axis. Moment of momentum and moment of force relative to a point. Equation of moments. The moment of inertia relative to an arbitrary axis. Moment of impulse and moment of force relative to the axis. The main equation of the dynamics of rotational motion relative to a fixed axis. Conditions of equilibrium of a solid body. [1] vol. 1, § 4.1-4.6.
6.	Chapter 1. Topic 1.6. The law of conservation of momentum.

	The law of conservation of momentum. for a closed system and its connection with the isotropy of space. Movement of bodies in the central field. Kepler's laws. Gyroscopic effect. *[1] Vol. 1, § 2.9, 6.1-6.6.*
7.	*Chapter 1. Topic 1.7. The principle of relativity.* *The principle of relativity in mechanics. Inertial frames of reference and the principle of relativity. Galileo's transformation. Invariance of the laws of classical mechanics with respect to Galilean transformations.* *[1] vol. 1, § 8.1-8.4.*
8.	*Chapter 1, topic 1.8.* *Special theory of relativity. Postulates of the special theory of relativity. Lorentz transformation. Consequences of Lorentz transformations: relativity of the length of bodies, relativity of time intervals, proper time, relativity of simultaneity. The law of addition of velocities.* *[1] vol. 1, § 9.1-9.5.*
9.	*Chapter 1, topic 1.9.* *Elements of relativistic dynamics. Relativistic momentum. Relativistic mass. The equation of motion of a relativistic particle. Relationship of mass and energy, energy and momentum. The principle of equivalence. Concept of general theory relativity* *[1] vol. 1, § 9.6-9.8.*
10. Chapter 1, topic 1.10.	*Elements of mechanics of continuous media. General properties of liquids and gases. Fluid movement. The continuity equation and the Bernoulli equation. Hydrodynamics viscous liquid. laminar and turbulent mode of liquid flow. Movement of bodies in liquids and gases. Viscosity coefficient. Flow of viscous liquids in pipes. Formula Poiseuille.* *[1] vol. 1, § 7.1-7.7.*
11. Chapter 2, topic 2.1. Thermodynamic and molecular-kinetic approaches in study of thermal properties of bodies (systems).	*Equilibrium and non-equilibrium states of macroscopic systems. Macroscopic parameters. Fluctuations. Relaxation time. The basic equation of the molecular-kinetic theory of an ideal gas, the Mendeleev-Clapeyron equation. Average kinetic energy of molecules and molecular kinetic determination of temperature. The concept of the number of degrees of freedom of molecules. The law of equal distribution of the average energy of molecules by degrees of freedom. The first principle of thermodynamics. Internal energy* *systems. Amount of heat. Body expansion work. Heat capacity of bodies. The classical theory of the heat capacity of an ideal gas and its experimental confirmation.* *[1] vol. 1, § 13, 14.*
12. Chapter 2. Topic 2.3. Basics of thermodynamics.	*Reversible and irreversible processes. The nature of irreversibility of processes. The concept of the statistical weight of the state of the macrosystem. Statistical definition of entropy. The law of increasing entropy. Circular process (cycle). Heat engine and refrigerating machines. The Carnot cycle and its efficiency. Efficiency of real heat engines. The second law thermodynamics. Different formulations of the second principle. Definition of entropy by Clausius. The law of entropy growth as the most general expression of the second principle.*

	The main inequality and the main equation of thermodynamics. Free energy of the system. The related energy of the system. *[1] vol. 1, § 16.*
13. Chapter 2. Topic 2.3. Transference phenomena.	*The concept of physical kinetics. Effective scattering cross section. Molecular movement and transfer phenomena. The average number of collisions per unit of time and the average length of the free path of molecules. Diffusion and thermal conductivity. Diffusion coefficient. Thermal conductivity coefficient. Diffusion in real gases and solids. Viscosity of gases and liquids. Dynamic and kinetic viscosity.* *[1] vol. 1, § 15.*
14. Chapter 2, topic 2.4.	*Real gases. The difference in the properties of real gases from ideal gases.* *Isotherms of real gases. Van der Waals model of a real gas. Van der Waals equation and its analysis. Unstable states. Internal energy of a real gas. Joule-Thomson effect. Liquefaction of gases. Superfluidity of helium.* *[1] vol. 1, § 17.*
15. Chapter 2, topic 2.5.	*liquids Characteristics of the liquid state. The surface layer of the liquid. Surface tension (specific surface energy). Wetting phenomenon. Laplace's formula. Capillary phenomena. Monomolecular layers and their properties. The concept of the molecular-kinetic theory of the liquid state. Near order in liquids.* *[1] vol. 1, § 19.*
16. Chapter 2, topic 2.6.	*Phase equilibria and transformations. Conditions for phase equilibrium in a single-component system system. Pressure-temperature state diagram. Triple point. Phase curve* *balance The Clapeyron-Clausius equation. The concept of phase transitions of the first and second kind.* *[1] vol. 1, § 21.*
17. Chapter 2, topic 2.7.	*Solid body. Phase transitions. Crystalline and amorphous solids. Crystal lattice. Defects in crystals (point, three-dimensional). Mechanical properties of crystalline solids. Phase transitions. Equilibrium conditions in a one-component system. Pressure-temperature state diagram.* *[1] vol. 1, § 18.*
18. Chapter 3. Topic 3.1. Electrostatic field in vacuum and its characteristics.	*Atomicity of electric charge. Law of conservation of electric charge. Coulomb's law. Electric field. Electric field strength. The principle of superposition. An electric dipole and its field. Operation of the electrostatic field. Circulation of the electrostatic field.* *[2] vol. 2, § 1.1-1.6.*
19. Chapter 3. Topic 3.1 Electrostatic field in a vacuum (continued).	*Potential. Connection of potential with tension. Lines of force and equipotential surfaces. Vector flow. Gauss' electrostatic theorem. Application of Gauss' theorem. The differential form of writing the Gauss theorem and the theorem about*

	circulation of electrostatic field strength. The Ostrogradsky-Gauss theorem. Stokes' theorem. *[2] vol. 2, § 1.7-1.11.*
20. Chapter 3. Topic 3.2 Conductor and dielectric in an electrostatic field.	*Conductors and dielectrics. Electric dipole and its properties. Electrostatic field potential. Electric potential. Dipole field tension and potential.* *[2] vol. 2, § 1.12-1.13.*
21. Chapter 3. Topic 3.2 Dielectric in an electrostatic field (continued).	*Free and bound charges. Polarization of dielectrics. Mechanism of polarization. Polarization and surface density of polarized charges. Dielectric susceptibility and permittivity and their dependence on temperature.* *[2] vol. 2, § 1.14-1.19.*
22. Chapter 3. Topic 3.2 Dielectric in an electrostatic field (continued).	*Gauss' theorem for the electric field in dielectrics. Electrical displacement. Electric field at the boundary of two dielectrics. Ferroelectrics.* *[2] vol. 2, § 1.20-1.23.*
23. Chapter 3. Topic 3.3 Conductors in an electrostatic field.	*Distribution of charges on the surface of the conductor. Conditions of balance of charges on a conductor. A conductor in an external electrostatic field. Boundary conditions at the "conductor-vacuum" interface. Electrostatic protection. Surface charge density.* *[5] vol. 2, § 1.11.*
24. Chapter 3. Topic 3.4. Electric field energy.	*Electric capacity of a separated conductor. Capacitors (flat, cylindrical, spherical). The method of mirror images. Energy of a charged conductor.* *[2] vol. 2, § 1.14, 1.25.*
25. Chapter 3. Topic 3.4. Electric field energy (continued).	*Energy of the system of point charges. The energy of the charged capacitor. Connection of capacitors. Electrostatic field energy. energy density* *electrostatic field.* *[2] vol. 2, § 1.26.*
26. Chapter 3. Topic 3.5. Direct current.	*Characteristics of direct current and its varieties. Continuity equation.* *Conditions for the existence of direct electric current. Classical electronic theory of electrical conductivity of metals and its experimental justification. Derivation of Ohm's law in differential form from classical electronic representations.* *[2] vol. 2, § 2.1-2.2.*
27. Chapter 3. Topic 3.5. Direct current (continued).	*Limits of application of Ohm's law. Wiedemann-Franz law. Generalized Ohm's law in integral form, potential difference, electromotive force, voltage. Kirchhoff's rules.*

	[2] vol. 2, § 2.3-2.7.

Practical classes

The purpose of the practical classes is the formation of students' practical problem-solving skills, in particular, the construction of physical models of processes, the selection of adequate mathematical models of physical processes, the selection of the optimal method of problem-solving.

The set of tasks [6] can be found on the website https:// kzf.kpi.ua/ pidruchnyky/ , as well as in the classroom on the Sikorsky platform.

Basic methods of solving problems, examples of solutions and methodical instructions https:// kzf.kpi.ua/ metodychni-posibnyky/ .

No. z/p	*Name of the subject of the lesson and list of main questions*
1.	*Chapter 1, topic 1.1.* *Elements of kinematics. [6] §1.1.*
2.	*Chapter 1, topic 1.2.* *Dynamics of a material point. [6] §1.2.*
3.	*Chapter 1, topic 1.3÷1.6.* *Dynamics of rotational motion of a rigid body. Conservation laws [6] § 1.3, 1.4*
4.	*Chapter 1, topic 1.7÷1.10.* *Elements of relativistic dynamics. Elements of mechanics of continuous media. [6] § 1.5, 1.6.*
5.	*Chapter 2, topic 2.1, 2.2.* *Thermodynamic and molecular-kinetic approaches in the study of thermal properties of bodies (systems). The first and second laws of thermodynamics. [6] § 2.1, 2.3.*
6.	*Chapter 2, topic 2.3÷2.7.* *Transference phenomena. Van der Waals equation. Phase equilibria and transformations. [6] § 2.2, 2.4.*
7.	*Chapter 3, topic 3.1.* *Electric field in a vacuum. [6] § 3.1.*
8.	*Chapter 3, topic 3.2.* *A dielectric in an electrostatic field. [6] § 3.2.*
9.	*Chapter 3, topic 3.3.* *Conductors in an electrostatic field. Direct current. Kirchhoff's rules. [6] § 3.3-3.5.*

Laboratory work

The purpose of the laboratory classes is the formation of students' practical skills for working in a physical laboratory - understanding the observed processes, using measuring devices, processing the obtained results - necessary in the process of further education and independent work.

Protocols of laboratory work can be found at the link https:// kzf.kpi.ua/ laboratornyj-praktykum/ , as well as in the classroom on the Sikorsky platform.

No. z/p	The name of the laboratory work	Number of aud. hours
1	Studying the theory of processing measurement results in physics laboratory using the example of a mathematical pendulum.	2
2	Study of the physical pendulum.	2
3	Studying the dynamics of rotational movement using a pendulum Oberbeck.	2
4	Determination of the viscosity of a liquid by the Stokes method.	2
5	Determination of the heat capacity ratio of gas at constant pressure to its heat capacity at constant volume.	2
6	Study of laminar gas flow through thin tubes.	2
7	Determination of the resistance of the conductor using a permanent bridge current (Whitstone bridge).	2
8	Measurement of electromotive force by the method of compensation.	2
9	Determining the capacity of the capacitor by the ballistic method galvanometer.	2

6. Independent work of a student/graduate student

The student's independent work is the main means of assimilating the educational material free time from educational classes and includes:

No. z/p	Type of independent work	Number hours of SRS
1	Preparation for classroom classes (practical, laboratory)	39
2	Preparation for MKR	6
3	Preparation for the exam	30

Policy and control

7. Policy of academic discipline (educational component)

The system of requirements that the teacher sets before the student:

*- **rules for attending classes:** in accordance with Order 1-273 dated 14.09.2020, it is prohibited to evaluate the presence or absence of the winner in the classroom class, including awarding incentive or penalty points. According to the RSO of this discipline, points are awarded for the corresponding types of educational activity in practical classes. - **rules of behavior in classes:** the student must properly follow the teacher's instructions regarding work in the class, behave discreetly and politely and not disturb other students and the teacher. The use of means of communication to search for information on the teacher's Google Drive, on the Internet, in a distance course on the Sikorsky platform is carried out on the condition that the teacher instructs;*

*- **policy of deadlines and rescheduling:** if a student did not pass or did not show up for the test (without a valid reason), his result is evaluated at 0 points. Completion of the test work is considered successful if the student received at least 50% of the maximum number of points for it. In the case of missing a test without a valid reason or failing to pass a test, rewriting the test is carried out in agreement with the teacher, while the maximum grade that the student can receive for the test is reduced by 2 points in relation to passing the test on time;*

*- **academic integrity policy:** the Code of Honor of the National Technical University of Ukraine "Ihor Sikorskyi Kyiv Polytechnic Institute" https:// kpi.ua/ files/ honorcode.pdf establishes general moral principles, rules of ethical behavior of individuals and provides a policy of academic integrity for individuals, who work and study at the university, which they should be guided by in their activities, including when studying and preparing control measures in the discipline "General Physics";*

*- **when using digital means of communication with the teacher** (mobile communication, e-mail, correspondence on forums and social networks, etc.), it is necessary to observe generally accepted ethical norms, in particular, to be polite and limit communication to the working hours of the teacher.*

8. Types of control and rating system for evaluating learning outcomes (RSO)

Types of control:

***Current control:** MKR.*

***Calendar control:** conducted twice a semester as a monitoring of the current state of fulfillment of the syllabus requirements.*

***Semester control:** exam. **Conditions for admission to semester control:** successful completion of all control tasks, semester rating of at least 30 points.*

In the first lesson, students get acquainted with the rating system of evaluation (RSO) of the discipline, which is built on the basis of the "Regulations on the system of evaluation of learning results", https://document.kpi.ua/files/2020_1-273.pdf.

A rating system for evaluating learning outcomes

*1. **The rating of the student** from the credit module is calculated from 100 points, of which 60 points make up the starting scale. The starting rating (during the semester) consists of points that the student has receives for:*

1) Three control papers (MKR is divided into 3 control papers with a duration of 0.67 Acad. hours);

2) protection of 6 laboratory works;

3) work in nine practical classes;

4) the answer to the exam.

*2. **Scoring criteria***

Tests: Weighted score – 6.

The maximum number of points for the three components of the MKR is 6 points × 3 = 18 points.

"Excellent" - 6 points.

"Good" - 5 points.

"Satisfactory" - 3-4 points.

"Unsatisfactory" - 0 - 2 points.

Laboratory works: The Weight score – 4.

maximum number of points for all laboratory works is equal to 4 points × 6 = 24 points.

Performance of laboratory work - 1 point.

Protection of work calculations - 1-3 points.

A complete answer at the colloquium - 2 points.

An incomplete answer at the colloquium - 1 point.

Absence at the colloquium - (-2) points.

Work in practical classes: Weighted score – 2.

The maximum number of points in all practical classes is equal to 18 points.

Full answer (excellent) - 2.0 points.

Partial answer ("good") - 1.5 points.

Satisfactory answer ("satisfactory") - 1.0 points.

Unsatisfactory answer ("unsatisfactory") - 0 points.

In the case of distance learning, practical classes are evaluated with the help of oral answers during the class and express control in the form of tests.

3. The condition of the first attestation is obtaining at least 10 points and successful completion of all control and laboratory work at the time of attestation. The condition of the second attestation is to obtain at least 20 points, to perform all control and laboratory work during the attestation.

4. The condition for admission to the exam is the successful completion of all control tests and laboratory tests as well as a starting rating of at least 30 points. 5. At the exam, students prepare short written calculations and give an oral answer. Each task contains two theoretical questions. Each question in the ticket is valued at 20 points according to the following criteria:

- "excellent", complete answer, at least 90% of the required information (complete, error-free solving the task) – 20-17 points;

- "good", sufficiently complete answer, at least 75% of the required information or minor inaccuracies (complete solution of the task with minor inaccuracies) - 16-13 points;

- "satisfactory", incomplete answer, at least 60% of the required information and some errors (task completed with certain shortcomings) - 12-8 points;

- "unsatisfactory", the answer does not meet the conditions for "satisfactory" - 0 points.

For an objective assessment of the student's knowledge, the teacher has the right to ask additional questions from the course program that are not included in the ticket.

6. The sum of the starting points and points for the examination work is transferred to the examination grade according to the table:

Number of points	Rating
100...95	Perfectly
94...85	Very good
84...75	Good
74...65	Satisfactorily
64...60	Enough
Less than 60	Unsatisfactorily
There are ungraded test papers or a starting rating of less than 30 points	Not allowed

9. Additional information on the discipline (educational component)

- *The list of questions is provided in the Electronic Campus of KPI named after Igor Sikorsky and in the folder course on the "Sikorsky" platform.*
- *Certificates of completion of distance or online courses on the relevant subject can be credited provided that the requirements specified in ORDER No. 7-177 DATED 10.01.2020 "On approval of the regulation on recognition in KPI named after Igor Sikorskyi of learning outcomes acquired in non-formal/ informal education".*

Working program of the academic discipline (syllabus):

Compiled by senior teacher Samar Hanna Volodymyrivna, senior teacher Zakharchenko Roman Valeriyovych.

Approved by the Department of General Physics of the Faculty of Physics and Mathematics (protocol No. 7 dated June 6, 2023)

Agreed by the Methodical Commission of the Faculty of Electrical Power Engineering and Automation (protocol No. 10 of 22 .06.2023)