SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialty 123 Computer Engineering
educational and professional programs Computer Engineering
Kharkiv National University of Radio Electronics

1.	Name of the faculty	Faculty of Computer Engineering and Control
2.	Level of higher education	bachelor
3.	Code and name of the specialty	123 Computer Engineering
4.	Type and name of educational program	Computer Engineering
5.	Code and name of the discipline	Physics
6.	Number of ECTS credits	6
7.	Discipline structure (distribution by types and hours of study)	1st semester 90 hours, of which: lectures 20 hours, practical 8 hours, laboratory 8 hours, consultations 6 hours, independent work 48 hours 2nd semester 90 hours, of which: lectures 20 hours, practical 8 hours, laboratory 8 hours, consultations 6 hours, independent work 48 hours
8.	The schedule of studying the discipline	1 course, 1,2 semesters
9.	Prerequisites for studying the discipline	Knowledge of the main sections of higher mathematics, including mathematical analysis (differential and integral calculus), analytical geometry and linear algebra (actions with vectors), chemistry (atomic-molecular theory, structure of atoms and molecules)
10.	Discipline abstract	**Content module 1. Classical mechanics.** Theme 1. Dynamics. Work and energy. Theme 2. Mechanical oscillations. Special theory of relativity**.** **Content module 2. Statistical physics and thermodynamics.** Theme 1. Statistical physics. Theme 2. Thermodynamics. **Content module 3. Electromagnetism and optics.** Theme 1. Electricity and magnetism. Theme 2. Magnetic field in matter. Optics. **Content module 4. Quantum physics and structure of matter.** Theme 1. Quantum physics. Theme 2. The structure of atoms, molecules and matter**.**
11.	Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	**Competences that provide the study of the discipline:** Ability to abstract thinking, analysis Ability to apply knowledge in practical situations Ability to model physical phenomena, perform theoretical and experimental studies. Ability to learn independently, to master new knowledge Ability to work with scientific equipment and measuring instruments, process and analyze the results of scientific research
12.	Learning outcomes of higher education	**The study of this discipline gives the student the opportunity to:** **know:** basic concepts, laws and theories that explain physical phenomena, as well as physical quantities by which to describe physical phenomena and processes; the essence of physical phenomena, their mechanisms, causal relationships in physical processes; limits of application of physical laws and theories of physics; theoretical and experimental methods of physical research; physical principles of operation of modern

<table>
<tr><td></td><td></td><td>technological equipment and apparatus; purpose and possibilities of application of the experimental equipment for carrying out physical research.
be able to: analyze the relationship of physical phenomena of different nature; apply physical knowledge to solve practical problems that arise during the development and operation of modern technology; to analyze the influence of physical phenomena on the modes of operation of modern technology; plan and conduct the simplest physical experiments using modern equipment and process the results of these experiments; highlight specific physical content in the applied problems of the future specialty.
have: the basics of conducting experimental research and processing their results, methods for estimating the errors of experiments.</td></tr>
<tr><td>13.</td><td>Assessment system according to each task for passing the exam</td><td>Assessment of students' knowledge of the discipline is based on the results of current control, modular control and exam, which are reflected in the final modular control.
The task of current control is to check the understanding and mastery of certain material, which is carried out during lectures, practical and laboratory classes in the form of discussion by students of current issues in the discipline, implementation of certain theoretical (express control of theoretical knowledge in practical and laboratory classes) and practical problem-solving, laboratory work) tasks (classroom work), as well as evaluating the results of their independent work (homework in practical classes) and individual performance visual calculation tasks (extracurricular work).
The task of modular control is to check the assimilation of educational material contained in this content module. Modular control is implemented in the appropriate forms of the educational process. Tasks submitted for modular control are evaluated in points. Modular control is performed in writing or by computer testing or control work. Modular control includes, in particular, computer testing and protection of the laboratory cycle.
Final module control is an assessment of students' knowledge of each of the credit modules, which is based on determining the amount of points (with appropriate weight) based on the results of current control for classroom and extracurricular activities, module control and exam. The final control is considered passed if the student received at least 60 points out of 100 possible. The obtained points are translated according to the national scale and the ECTS scale
To evaluate the student's work during the semester, the final rating is calculated as the sum of grades for different types of classes and control activities. The distribution of points for different types of classes / control activities is given in the table:
<table>
<tr><td>Type of lesson / control measure</td><td colspan="3">Rating O_{sem}</td></tr>
<tr><td>Lw</td><td colspan="3">0,3 O_{sem}</td></tr>
<tr><td>Pc</td><td colspan="3">0,3 O_{sem}</td></tr>
<tr><td>Checkpoint 1</td><td colspan="3"></td></tr>
<tr><td>Lw</td><td>15</td><td>…</td><td>25</td></tr>
<tr><td>Pc</td><td>15</td><td>…</td><td>25</td></tr>
<tr><td></td><td>30</td><td>…</td><td>50</td></tr>
<tr><td>Checkpoint 2</td><td colspan="3"></td></tr>
<tr><td>Lw</td><td>15</td><td>...</td><td>25</td></tr>
</table>
</td></tr>
</table>

		Pc	15	...	25
			30	**...**	**50**
		Total for the semester	**60**	**...**	**100**

To evaluate the student's work during the semester, the final rating O_{sem} is calculated as the sum of grades for different types of classes and control activities, which include practical classes, laboratory work, individual calculation task and modular testing.

The combined exam is used as a form of final control for the discipline "Physics". With this type of control, the final grade is calculated by the formula: $P_n = 0{,}6 \cdot O_{sem} + 0{,}4 \cdot O_{ex}$, where O_{sem} – grade for the semester in a 100-point system, O_{ex} – grade for the exam in a 100-point system.

The required amount of knowledge to obtain a positive assessment.

1. Basic concepts, laws and models of mechanics, electricity, magnetism, oscillations, waves, quantum physics, statistical physics, thermodynamics, atomic nucleus physics.
2. Limits of application of physical concepts and laws.
3. Principles of construction of physical models and their use.

The required amount of skills to obtain a positive assessment.

1. Calculation of parameters of physical objects, applying the basic concepts, laws and models of mechanics, electricity, magnetism, oscillations, waves, quantum physics and thermodynamics to solve practical problems.
2. Carrying out the simplest physical experimental researches.
3. Processing of results of experimental researches, using methods of an estimation of results of experiments and calculation of their errors.

The final grade is translated into national and ECTS according to the scale:

Grade from the discipline	Score on a national scale	ECTS scale score
96-100	5 (perfectly)	A
90-95	5 (perfectly)	B
75-89	4 (good)	C
66-74	3 (satisfactorily)	D
60-65	3 (satisfactorily)	E
35-59	2 (unsatisfactorily)	FX
1-34		F

14.	The quality of the educational process	The content of the discipline can be updated depending on the modern needs of the specialty.
15.	Methodical support	**Basic literature** 1. General physics with examples and problems. Part 1. Mechanics. Molecular physics and thermodynamics: a textbook. manual / V.O. Storozhenko and others. - Kharkiv: SMIT Company LLC, 2006. - 320 p. 2. General physics with examples and problems. Part 2. Electricity and magnetism: a textbook. manual. / I.M. Kibets and others. - Kharkiv: SMITH Company, 2009. - 424p .; 3. General physics with examples and problems. Part 3, item 1. Optics: a textbook / IM Kibets and others. - N .: SMITH Company, 2012. - 232p. 4. General physics with examples and problems. Part 3, item 2. Quantum

		and atomic physics. Solid state physics. Nuclear physics: a textbook / IM Kibets and others. –H .: SMITH Company, 2013. - 304p. **Accompanying literature** 1. Elementary physics in examples and problems: a textbook. Manual for preparatory departments / AD Tevyashev and others. - Kharkiv: KhNURE, 2005. - 628p. 2. Collection of tests in the course of physics / Edited by: OM Kovalenko and others. - Kharkiv: KNURE, 2006. - 124p 3. Dictionary of physical terms: a textbook / TB Tkachenko. - Kharkiv: KNURE, 2004. - 80p. 4. Savelyev IV Physics course. T.1,2,3. - M .: Nauka, 1989. **Methodical instructions for different types of classes** 1. Methodical instructions for software for the course of physics (part 1) / Edited by: V.O. Storozhenko and others. - Kharkiv: KNURE, 2013. - 152p. 2. Methodical instructions for software in physics (part 2) / Edited by: V.O. Storozhenko and others. - Kharkiv: KNURE, 2013. - 140p. 3. Methodical instructions for laboratory work in physics. Part 1. Mechanics and molecular physics. / Edited by: OV Vyshnivetsky and others. - Kharkiv: KNURE, 2009. - 84p. 4. Methodical instructions for laboratory work in physics. Part 2. Electricity and magnetism. / Edited by: RP Orel and others. - Kharkiv: KNURE, 2019. - 120p. 5. Methodical instructions for laboratory work in physics. (sections "Optics", "Atomic Physics", "Solid State Physics") / Edited by: V.O. Storozhenko and others. - Kharkiv: KNURE, 2011. - 56p. 6. Methodical instructions to computer laboratory works on physics. / Edited by: OM Kovalenko and others.- Kharkiv: KNURE, 2006. - 124p. 7. Questions and answers to laboratory work in physics. Part 1. Mechanics and molecular physics / Edited by: SS Avotin and others. - Kharkiv: KNURE, 2004. - 44p. 8. Questions and answers to laboratory work in physics. Part 2. Electricity and magnetism / Edited by: AI Rybalka and others. - Kharkiv: KNURE, 2004. - 60p. 9. Questions and answers to laboratory work in physics. Part 3. Atomic physics and solid state physics [Electronic edition] / Edited by: Rybalka AI - Kharkiv, KNURE, 2014. - 52p. **Information support:** 1. http://physic.nure.ua 2. http://www.alleng.ru/edu/phys9.htm 3. http://nuclphys.sinp.msu.ru/index.html 4. http://newlibrary.ru/genre/nauka/fizika 5. http://eqworld.ipmnet.ru/ru/library/physics/elementary.htm
16.	Syllabus developer	Professor of the Department of Physics Kozar Anatoliy Ivanovych anatoliy.kozar@nure.ua