SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialties G5 Electronics, electronic communications, instrumentation and radio engineering
of educational and professional program Infocommunication engineering and network security
Kharkiv National University of Radio Electronic

1.	Name of the faculty	Faculty of Infocommunications
2.	Level of higher education	bachelor
3.	Code and name of the specialty	G5 Electronics, electronic communications, instrumentation and radio engineering
4.	Type and name of educational program	Infocommunication engineering and network security
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 10 hours, laboratory 12 hours, consultations 6 hours, independent work 42 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, in particular linear and vector algebra, differential and integral calculus
10.	Discipline abstract	The discipline is a mandatory component of the cycle of general and special (professional) training of the educational and professional program Infocommunication Engineering and Network Security. The purpose of the discipline is to form in students basic concepts of the materialistic worldview, to create the foundations of training in the field of physics, which allow future specialists to navigate the flow of scientific and technical information, master special disciplines, and solve applied engineering problems in their specialty. **Content module 1. Electrostatics and direct current.** Theme 1. Electric field in vacuum. Theme 2. Electric field in dielectrics. Theme 3. Conductors in an electric field. Theme 4. Electric current. **Content module 2. Magnetism.** Theme 5. Magnetic field in vacuum. Theme 6. Magnetic field in matter. Theme 7. The phenomenon of electromagnetic induction. Theme 8. Electromagnetic field. **Content module 3. Electromagnetic oscillations and waves. Optics.** Theme 9. Electromagnetic oscillations and alternating current**.**. Theme10. Electromagnetic waves. Theme 11. Wave optics. Theme 12. Quantum optics**.** **Content module 4 Elements of quantum mechanics** Theme 13. Quantum mechanics. Theme 14. Quantum theory of the structure of atoms and molecules. Theme 15. Spontaneous and forced radiation.
11.	Competences, knowledge, skills, understanding, which is acquired by the applicant in	**Competencies that provide the study of the discipline:** **General competencies:** Ability to abstract thinking, analysis and synthesis.

<table>
<tr><td></td><td>higher education in the learning process</td><td>Ability to apply knowledge in practical situations.
Knowledge and understanding of the subject area and understanding of professional activity.
Ability to learn and master modern knowledge.
Ability to identify, pose and solve problems.
Professional competencies of the specialty:
Ability to understand the essence and significance of information in the development of a modern information society.
Ability to perform computer modeling of devices, systems and processes using universal application software packages.
Ability to perform work on managing the load flows of information and telecommunication systems and networks.
Ability to study scientific and technical information, domestic and foreign experience on the subject of an investment (or other) project of telecommunications and radio engineering facilities.
Ability to perform calculations in the process of designing structures and facilities of information and telecommunications networks, telecommunications and radio engineering systems, in accordance with the technical task using both standard and independently created methods, techniques and software tools for design automation.</td></tr>
<tr><td>12.</td><td>Learning outcomes of higher education</td><td>Program learning outcomes:
Knowledge of theories and methods of fundamental and general engineering sciences in the volume necessary for solving specialized tasks and practical problems in the field of professional activity.
Ability to participate in the creation of application software for elements (modules, blocks, nodes) of telecommunication systems, infocommunication, telecommunication networks, radio engineering systems and television and radio broadcasting systems, etc.
Ability to perform calculations of elements of telecommunication systems, infocommunication and telecommunication networks, radio engineering systems and television and radio broadcasting systems, according to the technical specifications in accordance with international standards, using design automation tools, including those created independently.
The ability to apply modern achievements in the field of professional activity in order to build promising telecommunication systems, infocommunication, telecommunication networks, radio engineering systems and television and radio broadcasting systems, etc.
The ability to administer telecommunication systems, infocommunication and telecommunication networks.
The ability to choose methods and tools for measuring parameters and operating characteristics of telecommunication systems, infocommunication, telecommunication networks, radio engineering systems and television and radio broadcasting systems and their elements.
The ability to initiate ideas and proposals to improve the efficiency of management, production, educational and other activities.</td></tr>
<tr><td>13.</td><td>Assessment system according to each task for passing the exam</td><td>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 and modular testing.
The distribution of points for different types of classes / tests is given in the tables:
Semester 1
<table><tr><td>Control measure</td><td>Rating O_{sem}</td></tr></table></td></tr>
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Lw №1	2 . . .	3
Lw №2	2 . . .	3
Lw №3 Control lesson	5 . . .	9
Pc №1	3 . . .	5
Pc №2	3 . . .	5
Pc №3	3 . . .	5
Test	8 . . .	13
Checkpoint 1	**26 . . .**	**43**
Lw №4	2 . . .	3
Lw №5	2 . . .	3
Lw №6 Control lesson	5 . . .	9
Pc №4	3 . . .	5
Pc №5	3 . . .	5
Test	7 . . .	12
Test paper	12	20
Checkpoint 2	**34 . . .**	**57**
Total for the semester	**60 . . .**	**100**

Semester 2

Control measure	Rating O_{sem}
Lw №1	2 . . . 3
Lw №2	2 . . . 3
Pc №1	3 . . . 5
Pc №2	3 . . . 5
Test	. . . 16
Checkpoint 1	**24 . . . 32**
Lw №3	2 . . . 3
Lw №4 Control lesson	12 . . . 20
Pc №3	3 . . . 5
Pc №4	3 . . . 5
Test	12 . . . 15
Test paper	12 . . . 20
Checkpoint 2	**36 . . . 68**
Total for the semester	**60 . . . 100**

As a form of final control for the discipline "Physics" credit is used in semester 1. The final grade is determined as the number of points received by the applicant for education for completing control activities during the semester.

The combined exam is used as a form of final control for the discipline "Physics" in semester 2. 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 final grade is translated into national and ECTS according to the scale:

Grade from the discipline	Score on a national scale		ECTS scale score
	exam	credit	
96-100	5 (perfectly)	passed	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)	not passed	FX
		1-34			F
14.	The quality of the educational process	Adherence to the principles of academic integrity (http://lib.nure.ua/plagiat). Timely updating of the content of the discipline depending on the modern needs of the specialty			
15.	Methodical support	**Basic literature** 1. General Physics with Examples and Problems. Mechanics: A Textbook for Students of All Specialties and Forms of Study [Electronic Resource] / Compiled by: A.I. Rybalka et al. – Kharkiv: KhNURE, 2024. – 220 p. 2. General physics with examples and problems. Part 2. Electricity and magnetism: textbook. manual./ IM Kibets and others. - Kharkiv: SMITH Company, 2009 - 424p .; 3. General physics with examples and problems. Part 3, item 1. Optics: textbook / IM Kibets and others. - H.: SMITH Company, 2012. - 232p. **Supporting literature** 1. Collection of tests from the course of physics / O.M. Kovalenko and others.- Kharkiv: KNURE, 2006. –124s. 2. Dictionary of physical terms: textbook / TB Tkachenko.- Kharkiv: KNURE, 2004.-80p. **Methodical instructions for different types of classes** 1. Methodical instructions for software in the course of physics (part 1) / Edited by: VO Storozhenko and others. –Kharkiv: KhNURE, 2013.-152p. 2. Methodical instructions for software in physics (part 2) / Edited by: VO Storozhenko and others. –Kharkiv: KhNURE, 2013.-140p. 3. Methodical instructions for laboratory work in physics. Part 2. Electricity and magnetism. / Edited by: RP Orel and others. - Kharkiv: KNURE, 2019. - 120p. 4. Methodical instructions for laboratory work in physics. Part 3. Optics. Atomic physics and solid state physics / Emphasis. Malik SB etc. - Kharkiv: KNURE, 2011. 5. Methodical instructions for computer laboratory work in physics./ Edited by: R. P. Orel, O. M. Kovalenko, A. I. Rybalka and others - Kharkiv: Khnure, 2021. - 132 **Information support:** https://physic.nure.ua. https://catalogue.nure.ua/knmz/?subdivision=24&level=0&query=undefined			
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