SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialty G5 Electronics, Electronic Communications, Instrument engineering and Radio Engineering
educational and professional program
Micro- and Nanoelectronics
Kharkiv National University of Radio Electronics

1.	Name of the faculty	Faculty of Electronic and Biomedical Engineering
2.	Level of higher education	bachelor
3.	Code and name of the specialty	G5 Electronics, Electronic Communications, Instrument engineering and Radio Engineering
4.	Type and name of educational program	Micro- and Nanoelectronics
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 Micro- and Nanoelectronics. 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. Mechanics** Topic 1. Kinematics Topic 2. Dynamics of translational motion. Topic 3. Work and energy. Topic 4. Dynamics of rotational motion. Topic 5. Mechanical oscillations. **Content module 2. Electric field** Topic 6. Electric field in vacuum. Topic 7. Electric field in dielectrics. Topic 8. Conductors in an electric field. Topic 9. Direct current. **Content module 3. Magnetism.** Topic 10. Magnetic field in vacuum. Topic 11. Electromagnetic induction. Topic 12. Magnetic field in matter. Topic 13. Electromagnetic field. Topic 14. Electromagnetic oscillations and alternating current.

<table>
<tr><td></td><td></td><td>Content module 4. Waves and optics. Elements of quantum mechanics.
Topic 15. Electromagnetic waves.
Topic 16. Wave optics.
Topic 17. Quantum optics.
Topic 18. Bohr's theory of the structure of the hydrogen atom.
Topic 19. Elements of quantum mechanics.</td></tr>
<tr><td>11.</td><td>Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process</td><td>Competencies that provide the study of the discipline:
General competencies:
GC 2. Knowledge and understanding of the subject area and understanding of professional activity.
GC 6. Ability to learn and master modern knowledge.
GC 7. Ability to search, process and analyze information from various sources.
GC 8. Interpersonal interaction skills.
GC 9. Ability to work in a team.
GC 14. Ability to preserve and multiply moral, cultural, scientific values and achievements of society based on understanding the history and patterns of development of the subject area, its place in the general system of knowledge about nature and society and in the development of society, technology and engineering, use various types and forms of physical activity for active recreation and leading a healthy lifestyle.</td></tr>
<tr><td>12.</td><td>Learning outcomes of higher education</td><td>PRN-3. Apply knowledge and understanding of physics, relevant theories, models and methods to solve practical problems of synthesizing micro- and nanosystems engineering devices.</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><th>Control measure</th><th>Rating O_{sem}</th></tr>
<tr><td>Lw №1</td><td>2 . . . 3</td></tr>
<tr><td>Lw №2</td><td>2 . . . 3</td></tr>
<tr><td>Lw №3 Control lesson</td><td>5 . . . 9</td></tr>
<tr><td>Pc №1</td><td>3 . . . 5</td></tr>
<tr><td>Pc №2</td><td>3 . . . 5</td></tr>
<tr><td>Pc №3</td><td>3 . . . 5</td></tr>
<tr><td>Test</td><td>8 . . . 13</td></tr>
<tr><td>Checkpoint 1</td><td>26 . . . 43</td></tr>
<tr><td>Lw №4</td><td>2 . . . 3</td></tr>
<tr><td>Lw №5</td><td>2 . . . 3</td></tr>
<tr><td>Lw №6 Control lesson</td><td>5 . . . 9</td></tr>
<tr><td>Pc №4</td><td>3 . . . 5</td></tr>
<tr><td>Pc №5</td><td>3 . . . 5</td></tr>
<tr><td>Test</td><td>7 . . . 12</td></tr>
<tr><td>Test paper</td><td>12 20</td></tr>
<tr><td>Checkpoint 2</td><td>34 . . . 57</td></tr>
<tr><td>Total for the semester</td><td>60 . . . 100</td></tr>
</table>
Semester 2</td></tr>
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<td>
<table>
<tr><th>Control measure</th><th>Rating O_{sem}</th></tr>
<tr><td>Lw №1</td><td>2 . . . 3</td></tr>
<tr><td>Lw №2</td><td>2 . . . 3</td></tr>
<tr><td>Pc №1</td><td>3 . . . 5</td></tr>
<tr><td>Pc №2</td><td>3 . . . 5</td></tr>
<tr><td>Test</td><td>. . . 16</td></tr>
<tr><td>Checkpoint 1</td><td>24 . . . 32</td></tr>
<tr><td>Lw №3</td><td>2 . . . 3</td></tr>
<tr><td>Lw №4 Control lesson</td><td>12 . . . 20</td></tr>
<tr><td>Pc №3</td><td>3 . . . 5</td></tr>
<tr><td>Pc №4</td><td>3 . . . 5</td></tr>
<tr><td>Test</td><td>12 . . . 15</td></tr>
<tr><td>Test paper</td><td>12 . . . 20</td></tr>
<tr><td>Checkpoint 2</td><td>36 . . . 68</td></tr>
<tr><td>Total for the semester</td><td>60 . . . 100</td></tr>
</table>

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:
<table>
<tr><th rowspan="2">Grade from the discipline</th><th colspan="2">Score on a national scale</th><th rowspan="2">ECTS scale score</th></tr>
<tr><th>exam</th><th>credit</th></tr>
<tr><td>96-100</td><td>5 (perfectly)</td><td rowspan="5">passed</td><td>A</td></tr>
<tr><td>90-95</td><td>5 (perfectly)</td><td>B</td></tr>
<tr><td>75-89</td><td>4 (good)</td><td>C</td></tr>
<tr><td>66-74</td><td>3 (satisfactorily)</td><td>D</td></tr>
<tr><td>60-65</td><td>3 (satisfactorily)</td><td>E</td></tr>
<tr><td>35-59</td><td rowspan="2">2 (unsatisfactorily)</td><td rowspan="2">not passed</td><td>FX</td></tr>
<tr><td>1-34</td><td>F</td></tr>
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<td>14.</td>
<td>The quality of the educational process</td>
<td>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</td>
</tr>
<tr>
<td>15.</td>
<td>Methodical support</td>
<td>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 .;</td>
</tr>
</table>

		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:** 1. https://physic.nure.ua. 2. https://catalogue.nure.ua/knmz/?subdivision=24&level=0&query=undefined
16.	Syllabus developer	Head of the Department of Physics Kovalenko Olena Mykolayivna, olena.kovalenko@nure.ua