**SYLLABUS**
**in the discipline "Physics"**
**for students of the first (bachelor's) level of higher education**
**specialties 172 Telecommunications and radio engineering**
**of educational and professional programs Infocommunication engineering, Information and network engineering**
**Kharkiv National University of Radio Electronic**

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| 1. | Name of the faculty | Faculty of Infocommunications |
| 2. | Level of higher education | bachelor |
| 3. | Code and name of the specialty | 172 Telecommunications and radio engineering |
| 4. | Type and name of educational program | Infocommunication engineering and network security, Information and network 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 10 hours, laboratory 12 hours, consultations 6 hours, independent work 42 hours<br>**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 | **Content module 1. Electrostatics and direct current.**<br>Theme 1. Electric field in vacuum.<br>Theme 2. Electric field in dielectrics.<br>Theme 3. Conductors in an electric field.<br>Theme 4. Electric current.<br>**Content module 2. Magnetism.**<br>Theme 5. Magnetic field in vacuum.<br>Theme 6. Magnetic field in matter.<br>Theme 7. The phenomenon of electromagnetic induction.<br>Theme 8. Electromagnetic field.<br>**Content module 3. Electromagnetic oscillations and waves. Optics.**<br>Theme 9. Electromagnetic oscillations and alternating current**..**<br>Theme10. Electromagnetic waves.<br>Theme 11. Wave optics.<br>Theme 12. Quantum optics**.**<br>**Content module 4 Elements of quantum mechanics**<br>Theme 13. Quantum mechanics.<br>Theme 14. Quantum theory of the structure of atoms and molecules.<br>Theme 15. Spontaneous and forced radiation. |
| 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:**<br>Ability for abstract thinking, analysis and synthesis<br>Ability to plan and manage time<br>Ability to learn and master modern knowledge<br>Ability to use basic methods, methods and means of receiving, transferring, processing and storing information<br>The ability to carry out calculations in the process of designing structures and means of information and telecommunication networks, telecommunication and radio engineering systems, in accordance with the |

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<tr><td></td><td></td><td>terms of reference using both standard and independently created methods, techniques and software for design automation.<br>Knowledge of the theory and methods of fundamental and general engineering sciences in the amount necessary for solving specialized problems and practical problems in the field of professional activity.</td></tr>
<tr><td>12.</td><td>Learning outcomes of higher education</td><td>The study of this discipline gives the student the opportunity to:<br>know: theories and methods of fundamental and general engineering sciences in the amount necessary for solving specialized problems and practical problems in the field of professional activity.<br>be able to: analyze the relationship of physical phenomena of various nature; apply physical knowledge to solve practical problems arising in the development and operation of telecommunication systems, infocommunication, telecommunication networks, radio engineering systems and television and radio broadcasting systems, and the like; analyze the influence of physical phenomena on the operating modes of modern technology; plan and conduct the simplest physical experiments using modern equipment and process the results of these experiments; to highlight a specific physical meaning in applied problems of the future specialty<br>have: readiness to study scientific and technical information, domestic and foreign experience on the subject of investment (or other project of telecommunications and radio engineering; the ability to carry out calculations in the process of designing structures and means of information and telecommunication networks, telecommunication and radio engineering systems, in accordance with the terms of reference using both standard and independently created methods, techniques and software for design automation.</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.<br>The distribution of points for different types of classes / tests is given in the table:<br>Semester 1
<table>
<tr><th>Control measure</th><th>Rating $O_{sem}$</th></tr>
<tr><td>Lw №1</td><td>2 . . . 4</td></tr>
<tr><td>Lw №2</td><td>2 . . . 4</td></tr>
<tr><td>Lw №3 Control lesson</td><td>5 . . . 10</td></tr>
<tr><td>Pc №1</td><td>4 . . . 7</td></tr>
<tr><td>Pc №2</td><td>4 . . . 7</td></tr>
<tr><td>Pc №3</td><td>4 . . . 7</td></tr>
<tr><td>Test</td><td>11 . . . 14</td></tr>
<tr><td>Checkpoint 1</td><td>32 . . . 53</td></tr>
<tr><td>Lw №4</td><td>2 . . . 4</td></tr>
<tr><td>Lw №5</td><td>2 . . . 4</td></tr>
<tr><td>Lw №6 Control lesson</td><td>5 . . . 10</td></tr>
<tr><td>Pc №4</td><td>4 . . . 7</td></tr>
<tr><td>Pc №5</td><td>4 . . . 7</td></tr>
<tr><td>Test</td><td>11 . . . 15</td></tr>
<tr><td>Checkpoint 2</td><td>28 . . . 47</td></tr>
<tr><td>Total for the semester</td><td>60 . . . 100</td></tr>
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**Semester 2**

| Control measure | Rating $O_{sem}$ |
|---|---|
| Lw №1 | 3 . . . 5 |
| Lw №2 | 3 . . . 5 |
| Pc №1 | 4 . . . 7 |
| Pc №2 | 4 . . . 7 |
| Test | 10 . . . 19 |
| **Checkpoint 1** | **24 . . . 43** |
| Lw №3 | 3 . . . 5 |
| Lw №4 Control lesson | 13 . . . 18 |
| Pc №3 | 4 . . . 7 |
| Pc №4 | 4 . . . 7 |
| Test | 12 . . . 20 |
| **Checkpoint 2** | **36 . . . 57** |
| **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 |

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| 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**<br>1. General physics with examples and problems. Part 2. Electricity and magnetism: textbook. manual./ IM Kibets and others. - Kharkiv: SMITH Company, 2009-424p .;<br>2. General physics with examples and problems. Part 3, item 1. Optics: textbook / IM Kibets and others. - H.: SMITH Company, 2012. - 232p.<br>**Supporting literature**<br>1. Collection of tests from the course of physics / O.M. Kovalenko and others.- Kharkiv: KNURE, 2006.-124p.<br>2. Dictionary of physical terms: textbook / TB Tkachenko.- Kharkiv: KNURE, 2004.-80p.<br>**Methodical instructions for different types of classes** |

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| | | 1. Methodical instructions for software in the course of physics (part 1) / Edited by: VO Storozhenko and others. –Kharkiv: KhNURE, 2013.-152p.<br>2. Methodical instructions for software in physics (part 2) / Edited by: VO Storozhenko and others. –Kharkiv: KhNURE, 2013.-140p.<br>3. Methodical instructions for laboratory work in physics. Part 2. Electricity and magnetism. / Edited by: RP Orel and others. - Kharkiv: KNURE, 2019. - 120p.<br>4. Methodical instructions for laboratory work in physics. Part 3. Optics. Atomic physics and solid state physics / Emphasis. Malik SB etc. - Kharkiv: KNURE, 2011.<br>5. Methodical instructions for computer laboratory work in physics./ O.M. Kovalenko and others.- Kharkiv: KNURE, 2006-124p.<br>**Information support:**<br>http://physic.nure.ua<br>http://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 |