SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialty 163 Biomedical Engineering
educational and professional program Biomedical Engineering

1.	Name of the faculty	Faculty of Electronic and Biomedical Engineering
2.	Level of higher education	bachelor
3.	Code and name of the specialty	163 Biomedical Engineering
4.	Type and name of educational program	Biomedical Engineering
5.	Code and name of the discipline	Physics
6.	Number of ECTS credits	10
7.	Discipline structure (distribution by types and hours of study)	1st semester 150 hours, of which: lectures 34 hours, practical 16 hours, laboratory hours 16, consultations 12 hours, independent work 72 hours 2nd semester 150 hours, of which: lectures 32 hours, practical 16 hours, laboratory 16 hours, consultations 12 hours, independent work 74 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 calculation), analytical geometry and linear algebra (actions with vectors), chemistry (atomic-molecular theory, structure of atoms and molecules).
10.	Discipline abstract	**Content module 1. Physical foundations of mechanics.** Theme1. Kinematics. Theme 2. Dynamics of translational motion. Theme 3. Work and energy. Theme 4. Dynamics of rotational motion. Theme 5. Mechanical oscillations. **Content module 2. Molecular physics and thermodynamics.** Theme 6. Molecular-kinetic theory of an ideal gas. Theme 7. Classical statistical physics. Theme 8. Thermodynamics. **Content module 2. Electrostatics.** Theme 9. Electric field in vacuum. Theme 10. Electric field in dielectrics. Conductors in an electric field. Theme 11. Direct current. **Content module 4. Magnetic field.** Theme 12. Magnetic field in vacuum. Theme 13. Magnetic field in matter. Theme 14. Electromagnetic induction. **Content module 5. Oscillations and waves. Optics.** Theme 15. Electromagnetic field. Theme 16. Electromagnetic oscillations and alternating current Theme 17. Waves. Theme 18. Wave optics. Theme 19. Quantum optics. **Content module 6. Elements of quantum mechanics and solid state physics**. Theme 20. Quantum mechanics. Theme 21. Quantum theory of the structure of atoms and molecules. Theme 22. Band theory of electrical conductivity of solids.

<table>
<tr><td></td><td></td><td>Theme 23. Electrical conductivity of metals and semiconductors.</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>Competences that provide the study of the discipline:
Ability to abstract thinking, analysis, the ability to navigate in the flow of scientific and technical information.
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, solve applied engineering problems in their specialty.</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:
know: basics of physical laws and fundamental physical concepts, laws and theories of classical and modern physics and the limits of their application, the essence of physical phenomena, areas of their practical use, physical principles of modern technological equipment and apparatus in the field of professional activity; 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 knowledge of physical laws to solve practical problems that arise during the development and operation of radio systems and television and radio broadcasting systems, etc .; 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: modern methods of experimental physical research and processing of their results, basic methods of working with physical equipment and 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>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 final grade is translated into national and ECTS according to the scale:
<table>
<tr><th>Grade from the discipline</th><th>Score on a national scale</th><th>ECTS scale score</th></tr>
<tr><td>96-100</td><td>5 (perfectly)</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>FX</td></tr>
<tr><td>1-34</td><td>F</td></tr>
</table></td></tr>
<tr><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>
</table>

15.	Methodical support	**Basic literature** 1. General physics with examples and problems. Part 1. Mechanics. Molecular physics and thermodynamics: textbook. manual./ VO Storozhenko and others. - Kharkiv: SMITH Company, 2006 - 320p .; 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. manual / IM Kibets and others. - H.: SMITH Company, 2012. - 232p. 4. General physics with examples and problems. Part 3, item 2. Quantum and atomic physics. Solid state physics. Nuclear physics: textbook / IM Kibets and others. - H.: SMITH Company, 2013. - 304p. **Supporting literature** 1. Collection of tests in the course of physics / O.M. Kovalenko and others.- Kharkiv: KNURE, 2006.-124p. 2. Dictionary of physical terms: textbook / T.B. 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 1. Mechanics and molecular physics. / Edited by: OV Vyshnivetsky and others. - Kharkiv: KNURE, 2009. - 84p. 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./ O.M. Kovalenko and others.- Kharkiv: KNURE, 2006-124p. **Information support:** http://physic.nure.ua 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