

SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialty G22 Biomedical engineering
educational and professional program Biomedical engineering
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	G22 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 16 hours, consultations 10 hours, independent work 74 hours 2nd semester 150 hours, of which: lectures 32 hours, practical 16 hours, laboratory 16 hours, consultations 10 hours, independent work 76 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	<p>The discipline is included before the obligatory components of the cycle of general and special (facial) training of the educational and professional program of Biomedical Engineering.</p> <p>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.</p> <p>Semester 1</p> <p>Module 1. Physical Foundations of Mechanics and Molecular Physics.</p> <p>Topic 1. Kinematics.</p> <p>Topic 2. Dynamics of Translational Motion.</p> <p>Topic 3. Work and Energy.</p> <p>Topic 4. Dynamics of Wrapped Motion.</p> <p>Topic 5. Mechanical Oscillations</p> <p>Topic 6. Molecular-Kinetic Theory of an Ideal Gas. Laws of Confusion.</p> <p>Topic 7. Thermodynamics.</p> <p>Module 2. Electrostatics. Electrodynamics</p> <p>Topic 8. Electric Field in Vacuum.</p> <p>Topic 9. Electric Field in Dielectrics.</p> <p>Topic 10. Prognosticators of Electric Irrigation.</p> <p>Topic 11. Continuous Stream.</p> <p>Semester 2</p> <p>Module 3. Magnetic Field. Electromagnetic Phenomena.</p> <p>Topic 12. Magnetic Field in Vacuum.</p> <p>Topic 13. Electromagnetic Induction.</p> <p>Topic 14. Magnetic Field in Speech.</p>

		Topic 15. Electromagnetic Field. Topic 16. Electromagnetic Oscillation and Stellar Sound. Topic 17. Spring Waves Topic 18. Electromagnetic Waves. Module 4. Waves. Optics. Elements of Quantum Mechanics and Solid State Physics. Topic 19. Wave Optics Topic 20. Quantum Optics. Topic 21. Bohr's Theory of the Future of the Water Atom. Wave Theory of Microfrequencies. Topic 22. Schrödinger's equation and its stagnation. Topic 23. Quantum theory of the formation of atoms and molecules. Topic 24. Quantum statistics. Topic 25. Zone of the theory of electrical conductivity of solids. Topic 26. Contact phenomena.						
11.	Competences, knowledge, skills, understanding, which is acquired by the applicant in higher education in the learning process	Competencies that provide the study of the discipline: GC 1. Ability to apply knowledge in practical situations. GC 2. Knowledge and understanding of the subject area and understanding of professional activity. GC 3. Ability to communicate in the state language both orally and in writing. GC 4. Skills in using information and communication technologies. GC 5. Ability to conduct research at the appropriate level. GC 6. Ability to search, process and analyze information from various sources. GC 7. Ability to generate new ideas (creativity). GC 8. Ability to make informed decisions. GC 9. Ability to communicate with representatives of other professional groups of different levels (with experts from other fields of knowledge/types of economic activity). PC 12. Ability to apply basic knowledge, at a minimum, in general physics, theory of electric and magnetic circuits, analog and digital circuitry, electronic devices, and microprocessor technology, to the extent necessary to provide engineering training in the chosen profession.Competencies that provide the study of the discipline:						
12.	Learning outcomes of higher education	PRN 1. To develop knowledge of the fundamentals of mathematics, physics and biophysics, bioengineering, chemistry, engineering graphics, mechanics, the support and value of materials, the power of gases and liquids, electronics, computer science, signal and image detection and analysis, automatic control, system analysis and decision-making methods on par with those required for advanced tasks in biomedical engineering.						
13.	Assessment system according to each task for passing the exam	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: <div style="text-align: center;">Semester 1</div> <table><tr><td>Control measure</td><td>Rating O_{sem}</td></tr><tr><td>Lw №1</td><td>2 . . . 2</td></tr><tr><td>Lw №2</td><td>2 . . . 2</td></tr></table>	Control measure	Rating O_{sem}	Lw №1	2 . . . 2	Lw №2	2 . . . 2
Control measure	Rating O_{sem}							
Lw №1	2 . . . 2							
Lw №2	2 . . . 2							

Lw № 3	2 ... 2
Lw № 4	3 ... 6
Pc №1	3 ... 4
Pc №2	3 ... 4
Pc №3	4 ... 4
Pc №4	3 ... 4
Test	8 ... 12
Checkpoint 1	27 ... 40
Lw №5	2 ... 2
Lw №6	2 ... 2
Lw №7	3 ... 2
Lw №8	3 ... 6
Pc №5	4 ... 4
Pc №6	4 ... 4
Pc №7	8 ... 4
Pc №8	8 ... 4
Test	8 ... 20
ICT	8 ... 12
Checkpoint 2	33 ... 60
Total for the semester	60 ... 100

Semester 2

Control measure	Rating O_{sem}
Lw №1	2 ... 2
Lw №2	2 ... 2
Lw № 3	2 ... 2
Lw № 4	3 ... 6
Pc №1	3 ... 4
Pc №2	3 ... 4
Pc №3	4 ... 4
Pc №4	3 ... 4
Test	8 ... 12
Checkpoint 1	27 ... 40
Lw №5	2 ... 2
Lw №6	2 ... 2
Lw №7	3 ... 2
Lw №8	3 ... 6
Pc №5	4 ... 4
Pc №6	4 ... 4
Pc №7	8 ... 4
Pc №8	8 ... 4
Test	8 ... 20
ICT	8 ... 12
Checkpoint 2	33 ... 60
Total for the semester	60 ... 100

		<p>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.</p> <p>The final grade is translated into national and ECTS according to the scale:</p> <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>2 (unsatisfactorily)</td><td rowspan="2">not passed</td><td>FX</td></tr><tr><td>1-34</td><td></td><td>F</td></tr></table>	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	Compliance with the principles of academic integrity (http://lib.nure.ua/plagiat). Updating the work program of the discipline - 2025																													
15.	Methodical support	<p>Basic Literature:</p> <p>1. Zagal'na fizyka z prykladamy i zadachamy. Chastyna 1. Mehanika. Molekuljarna fizyka ta termodynamika: navch. Posibnyk/ V.O. Storozhenko ta in.-Harkiv: TOV «Kompanija SMIT», 2006. – 320 s.</p> <p>2. Zahalna fizyka z prykladamy ta zadachamy. Mekhanika: navchalnyi posibnyk dlja studentiv usikh spetsialnostei i form navchannia [Elektronnyi resurs] / A. I. Rybalka, O. M. Kovalenko, R. P. Orel ta in. ; M-vo osvity i nauky Ukrainy, Kharkiv. nats. un-t radioelektroniky. – Kharkiv : KhNURE, 2024. – 220 s.</p> <p>3. Zagal'na fizyka z prykladamy i zadachamy. Chastyna 2. Elektryka ta magnetyzm: navch. posibnyk. / I.M. Kibec' ta in. - Harkiv: «Kompanija SMIT», 2009 – 424s.;</p> <p>4. Zagal'n afizyka z prykladamy i zadachamy. Chastyna 3, t.1. Optyka: navch.posibnyk / I.M. Kibec' ta in. – H.:Kompanija SMIT, 2012. – 232s.</p> <p>5. Zagal'na fizyka z prykladamy i zadachamy. Chastyna 3, t.2. Kvantova ta atomna fizyka. Fizyka tverdogo tila. Jaderna fizyka: navch.posibnyk / I.M.Kibec' ta in. –H.:Kompanija SMIT, 2013.–304s..</p> <p>Additional literature:</p> <p>1. Elementarnaja fizyka v prymerah y zadachah: ucheb. Posobyje dlja podgotovytel'nih otdelenyj/ A.D. Tevjashev y dr. – Har'kov: HNURE, 2005. - 628s.</p> <p>2. Zbirnyktestiv z kursufizyky/ O.M. Kovalenko ta in.-Harkiv: HNURE,2006.-124s.</p> <p>3. Slovnyk fizychnyh terminiv: navch.-dovidkovyj posibnyk/ T.B. Tkachenko.-Harkiv: HNURE,2004.-80s.</p> <p>Methodical instructions to take up views:</p> <p>1. Metodychni vkazivky do PZ z kursufizyky (chastyna 1)/Uporjad.:V.O.Storozhenko ta in. –Harkiv:HNURE, 2013.-152s.</p> <p>2. Metodychni vkazivky do PZ z fizyky (chastyna2)/Uporjad.:V.O.Storozhenko ta in. –Harkiv:HNURE, 2013.-140s.</p>																													

		<p>3. Metodychni vkazivky do laboratornyh robit z fizyky. Chastyna 1. Mehanika ta molekuljarnafizyka. / Uporjad.: O.V. Vyshnivec'kyj ta in. – Harkiv: HNURE, 2009. – 84s.</p> <p>4. Metodychni vkazivky do laboratornyh robit z fizyky. Chastyna 2. Elektryka i magnetyzm. / Uporjad.: R. P. Orel ta in. – Harkiv: HNURE, 2019. – 120s.</p> <p>5. Metodychni vkazivky do laboratornyh robit z fizyky. Chastyna 3. Optyka. Atomnafizyka ta fizykatverdogotila / Upor. Malyk S.B. ta in.- Harkiv: HNURE, 2011.</p> <p>6. Metodychni vkazivky do kompiuternykh laboratornykh robit z dystsypliny «FIZYKA» dlia studentiv usikh spetsialnostei i form navchannia / Uporiad.: R. P. Orel, O. M. Kovalenko, A. I. Rybalka ta inshi – Kharkiv: KhNURE, 2021. – 132 s.</p> <p>Information support:</p> <ol style="list-style-type: none"> 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