SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialty G5 Engineering, manufacturing and construction
educational and professional program Radio-electronic devices of embedded systems

1.	Name of the faculty	Faculty of Automatics and Computerized Technologies
2.	Higher education level	Bachelor
3.	Code and name of the specialty	G5 Engineering, manufacturing and construction
4.	Type and name of educational program	Radio-electronic devices of embedded systems
5.	Code and name of the discipline	Physics
6.	Number of ECTS credits	6
7.	Structure of the discipline (distribution by types and hours of study)	1st semester 150 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 hours 8, consultations 8 hours, self-work 46 hours
8.	Schedule of study of the discipline	1st year, 1st and 2nd semester
9.	Prerequisites for studying the discipline	Knowledge of the beginning of mathematical analysis (integral and differential computation), analytical geometry and linear algebra (actions with vectors), chemistry (atomic-molecular theory, structure of atoms and molecules).
10.	Discipline abstract	The main method of the course is to provide students with the foundations of broad theoretical training in physics, which allows them to navigate the current scientific and technical information, to learn new physical principles in the fields of technology behind their future. **Content module 1. Classical 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. Topic 6. Special theory of relativity. **Content module 2. Electrostatics. Electrodynamics**. Topic 7. Electric field in vacuum. Topic 8. Electric field in dielectrics. Topic 9. Conductors in an electric field. Topic 10. Direct electric current. **Content module 3. Magnetism.** Topic 11. Magnetic field in vacuum Topic 12. Electromagnetic induction. Topic 13. The magnetic field in matter. Topic 14. Electromagnetic field. Topic 15. Electromagnetic oscillations and alternating current. **Content module 4. Electromagnetic oscillations and waves. Optics. Elements of quantum mechanics.** Topic 16. Electromagnetic waves Topic 17. Wave optics Topic 18. Quantum optics. Topic 19. Bohr's theory of the structure of the hydrogen atom.

<table>
<tr><td></td><td></td><td>Topic 20. Elements of quantum mechanics.</td></tr>
<tr><td>11.</td><td>Competences, knowledge, skills, understanding, which is acquired by the applicant of higher education in the process of learning</td><td>Competence, which provides the study of the discipline:
Ability to abstract thinking, analysis
Ability to apply knowledge in practical situations.
Ability to model physical phenomena, perform theoretical and experimental research.
Ability to learn independently, master new knowledge.
Ability to apply knowledge of physics to the extent necessary to understand processes in automation systems and computer-integrated technologies.
Ability to justify the choice of technical means of automation based on understanding the principles of their operation, analysis of their properties, purpose and technical characteristics, taking into account the requirements for the automation system and operating conditions; adjust technical means of automation and control systems.
Ability to work with scientific equipment and measuring instruments, process and analyze the results of scientific research.</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 the basic concepts, laws and theories that explain physical phenomena, as well as physical quantities by which to describe physical phenomena and processes at the level necessary for solving typical tasks and problems of automation;
Know the essence of physical phenomena, their mechanisms, causal relationships in physical processes; limits of application of physical laws and theories of physics;
Know the theoretical and experimental methods of physical research;
Know the physical principles of operation of modern technological equipment and apparatus;
Know the 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 and their influence on the modes of operation of modern technology;
Be able to plan and conduct the simplest physical experiments using modern equipment and process the results of these experiments;
Have the ability to conduct experimental research with modern methods and process their results,</td></tr>
<tr><td>13.</td><td>Assessment system for each task for passing the test / exam</td><td>For assessment 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 distribution of points for different types of classes / control measure is given in the table:
Semester 1
<table><tr><th>Types of classes / 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</td><td>5 9</td></tr><tr><td>Pl №1</td><td>3 . . . 6</td></tr><tr><td>Pl №2</td><td>3 . . . 6</td></tr><tr><td>Pl №3</td><td>4 . . . 6</td></tr></table></td></tr>
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Test	8 . . .	14
Checkpoint 1	**27 . . .**	**47**
Lw №4	2 . . .	3
Lw №5	2 . . .	3
Lw №6	5	9
Pl №4	4 . . .	6
Pl №5	4 . . .	6
ICT	8 . . .	12
Test	8 . . .	14
Checkpoint 2	**33 . . .**	**53**
Total for the semester	**60 . . .**	**100**

Semester 2

Types of classes / control measure	Оцінка $O_{сем}$
Lw №1	2 . . . 4
Lw №2	2 . . . 4
Pl №1	4 . . . 7
Pl №2	4 . . . 7
Test	9 . . . 15
Checkpoint 1	**21 . . . 37**
Lw №3	2 . . . 4
Lw №4	13 . . . 18
Pl №3	4 . . . 7
Pl №4	4 . . . 7
ICT	7 . . . 12
Test	9 . . . 15
Checkpoint 2	**39 . . . 63**
Total for the semester	**60 . . . 100**

The combined exam is used as a form of final control for the discipline "Physics". With this type of control, the final grade P_n 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 P_n is translated into national and ECTS according to the scale:

Assessment in the discipline	Assessment on a national scale	Assessment on the ECTS scale
96-100	5 (excellent)	A
90-95	5 (excellent)	B
75-89	4 (good)	C
66-74	3 (satisfactory)	D
60-65	3 (satisfactory)	E
35-59	2 (unsatisfactory)	FX
1-34		F

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 in 2025.

15.	Methodical support	**Basic Literature:** 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. 2. Zahalna fizyka z prykladamy ta zadachamy. Mekhanika: navchalnyi posibnyk dlia 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. 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.; 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. 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.. **Additional literature:** 1. Elementarnaja fyzyka v prymerah y zadachah: ucheb. Posobye dlja podgotovytel'nih otdelenyj/ A.D. Tevjashev y dr. – Har'kov: HNURE, 2005. - 628s. 2. Zbirnyktestiv z kursufizyky/ O.M. Kovalenko ta in.-Harkiv: HNURE,2006.-124s. 3. Slovnyk fizychnyh terminiv: navch.-dovidkovyj posibnyk/ T.B. Tkachenko.-Harkiv: HNURE,2004.-80s. **Methodical instructions to take up views:** 1. Metodychni vkazivky do PZ z kursufizyky (chastyna 1)/Uporjad.:V.O.Storozhenko ta in. –Harkiv:HNURE, 2013.-152s. 2. Metodychni vkazivky do PZ z fizyky (chastyna2)/Uporjad.:V.O.Storozhenko ta in. –Harkiv:HNURE, 2013.-140s. 3. Metodychni vkazivky do laboratornyh robit z fizyky. Chastyna 1. Mehanika ta molekuljarnafizyka. / Uporjad.: O.V. Vyshnivec'kyj ta in. – Harkiv: HNURE, 2009. – 84s. 4. Metodychni vkazivky do laboratornyh robit z fizyky. Chastyna 2. Elektryka i magnetyzm. / Uporjad.: R. P. Orel ta in. – Harkiv: HNURE, 2019. – 120s. 5. Metodychni vkazivky do laboratornyh robit z fizyky. Chastyna 3. Optyka. Atomnafizyka ta fizykatverdogotila / Upor. Malyk S.B. ta in.-Harkiv: HNURE, 2011. 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. **Information support:** https://physic.nure.ua https://catalogue.nure.ua/knmz/?subdivision=24&level=0&query=undefined
16.	Syllabus developer	Associated Professor of Physics Department Orel Roman Petrovich, roman.orel@nure.ua