SYLLABUS
in the discipline "Physics"
for students of the first (bachelor's) level of higher education
specialty 173 Avionics
educational and professional program Embedded system in avionics

1.	Name of the faculty	Faculty of Automatics and Computerized Technologies
2.	Higher education level	Bachelor
3.	Code and name of the specialty	173 Avionics
4.	Type and name of educational program	Embedded system in avionics
5.	Code and name of the discipline	Physics
6.	Number of ECTS credits	10
7.	Structure of the discipline (distribution by types and hours of study)	1st semester 150 hours, of which: lectures 36 hours, practical 14 hours, laboratory 16 hours, consultations 12 hours, independent work 72 hours 2nd semester 150 hours, of which: lectures 36 hours, practical 14 hours, laboratory hours 14, consultations 12 hours, self-work 74 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 goal of teaching the course is to create for students the foundations of a broad theoretical training in the field of physics, which will allow them to navigate the flow of scientific and technical information, to apply new physical principles in the field of technology in their future profession. **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. **Content module 2. Mechanical oscillations. Special theory of relativity. Molecular physics and thermodynamics.** Topic 5. Mechanical oscillations. Topic 6. Special theory of relativity. Topic 7. Molecular physics. Topic 8. Thermodynamics. **Content module 3. Electrostatics. Electrodynamics**. Topic 9. Electric field in vacuum. Topic 10. Electric field in dielectrics. Topic 11. Conductors in an electric field. Topic 12. Direct electric current. **Content module 4. Magnetism. Electromagnetic oscillations and waves.** Topic 13. Magnetic field in vacuum Topic 14. Electromagnetic induction. Topic 15. The magnetic field in matter. Topic 16. Electromagnetic field. Topic 17. Electromagnetic oscillations and alternating current. Topic 18. Elastic waves Topic 19. Electromagnetic waves **Content module 5. Optics. Elements of quantum mechanics.** Topic 20. Wave optics

		Topic 21. Quantum optics. Topic 22. Bohr's theory of the structure of the hydrogen atom. Topic 23. Wave theory of microparticles. Topic 24. Schrödinger's equation and its application. **Content module 6. Quantum theory of the structure of atoms and molecules. Solid state physics.** Topic 25. Quantum theory of the structure of the hydrogen atom. Topic 26. The structure of many electron atoms. Topic 27. Structure of molecules and molecular spectra. Topic 28. Quantum statistics. Topic 29. Zone theory. Topic 30. Contact phenomena.
11.	Competences, knowledge, skills, understanding, which is acquired by the applicant of higher education in the process of learning	**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 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
12.	Learning outcomes of higher education	**The study of this discipline gives the student the opportunity to:** know: basic concepts, laws and theories that explain physical phenomena, as well as physical quantities by which to describe physical phenomena and processes; the essence of physical phenomena, their mechanisms, causal relationships in physical processes; limits of application of physical laws and theories of physics; theoretical and experimental methods of physical research; physical principles of operation of modern technological equipment and apparatus; 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 physical knowledge to solve practical problems that arise during the development and operation of modern technology; 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: the ability to conduct experimental research with modern methods and process their results, the ability to apply basic knowledge of physics to the extent necessary to provide engineering training in the chosen profession.

13.	Assessment system for each task for passing the test / exam	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 / tests is given in the table:

Semester 1

Control measure	Rating O_{sem}
Lw №1	1 . . . 2
Lw №2	1 . . . 2
Lw №3	1 . . . 2
Pc №1	2 . . . 4
Pc №2	2 . . . 4
Pc №3	2 . . . 4
Test	7 . . . 10
Checkpoint1	**16 . . . 28**
Lw №4	7 . . . 11
Lw №5	1 . . . 2
Lw №6	1 . . . 2
Pc №4	2 . . . 4
Pc №5	2 . . . 4
Test	7 . . . 10
Checkpoint2	**20 . . . 33**
Lw №7	1 . . . 2
Lw №8	7 . . . 11
Pc №6	2 . . . 4
Pc №7	2 . . . 4
ICT	5 . . . 8
Test	7 . . . 10
Checkpoint3	**24 . . . 39**
Total for the semester	**60 . . . 100**

Semester 2

Control measure	Rating O_{sem}
Lw №1	1 . . . 2
Lw №2	1 . . . 2
Lw №3	1 . . . 2
Pc №1	2 . . . 4
Pc №2	2 . . . 4
Pc №3	2 . . . 4
Test	7 . . . 11
Checkpoint1	**16 . . . 29**
Lw №4	8 . . . 12
Lw №5	1 . . . 2
Pc №4	2 . . . 4
Pc №5	2 . . . 4
Test	8 . . . 11
Checkpoint2	**21 . . . 33**
Lw №6	1 . . . 2
Lw №7	5 . . . 9
Pc №6	2 . . . 4
Pc №7	2 . . . 4

		<table><tr><td>ICT</td><td>5 . . . 8</td></tr><tr><td>Test</td><td>8 . . . 11</td></tr><tr><td>Checkpoint3</td><td>23 . . . 38</td></tr><tr><td>Total for the semester</td><td>60 . . . 100</td></tr></table> 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: <table><tr><th>Assessment in the discipline</th><th>Assessment on a national scale</th><th>Assessment on the ECTS scale</th></tr><tr><td>96-100</td><td>5 (excellent)</td><td>A</td></tr><tr><td>90-95</td><td>5 (excellent)</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 (satisfactory)</td><td>D</td></tr><tr><td>60-65</td><td>3 (satisfactory)</td><td>E</td></tr><tr><td>35-59</td><td rowspan="2">2 (unsatisfactory)</td><td>FX</td></tr><tr><td>1-34</td><td>F</td></tr></table>
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:** 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. Zagal'na fizyka z prykladamy i zadachamy. Chastyna 2. Elektryka ta magnetyzm: navch. posibnyk. / I.M. Kibec' ta in. - Harkiv: «Kompanija SMIT», 2009 – 424s.; 3. Zagal'na fizyka z prykladamy i zadachamy. Chastyna 3, t.1. Optyka: navch.posibnyk / I.M. Kibec' ta in. – H.:Kompanija SMIT, 2012. – 232s. 4. 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. Zbirnyk testiv z kursu fizyky/ O.M. Kovalenko ta in.- Harkiv: HNURE,2006.-124s. 3. Slovnyk fizychnyh terminiv: navch.-dovidkovyj posibnyk/ T.B. Tkachenko.- Harkiv: HNURE,2004.-80s. 4. Savel'ev Y.V.Kurs fyzyky. T.1,2,3.-M.:Nauka, 1989. **Methodical instructions to take up views:** 1. Metodychni vkazivky do PZ z kursu fizyky (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 molekuljarna fizyka. / 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. Atomna fizyka ta fizyka tverdogo tila / Upor. Malyk S.B. ta in.- Harkiv: HNURE, 2011. 6. Metodychni vkazivky do komp'juternyh laboratornyh robit z fizyky./ O.M. Kovalenko ta in.- Harkiv:HNURE, 2006-124s. **Information support:** http://physic.nure.ua http://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