### **SYLLABUS**

### in the discipline "Physics"

## for students of the first (bachelor's) level of higher education

# specialty G5 Electronics, Electronic Communications, Instrument engineering and Radio Engineering educational and professional program

### **Micro- and Nanoelectronics**

### **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	G5 Electronics, Electronic Communications, Instrument engineering and Radio Engineering
4.	Type and name of educational program	Micro- and Nanoelectronics
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 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	The discipline is a mandatory component of the cycle of general and special (professional) training of the educational and professional program Microand Nanoelectronics.  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.  Content module 1. 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.  Content module 2. Electric field  Topic 6. Electric field in vacuum.  Topic 7. Electric field in dielectrics.  Topic 8. Conductors in an electric field.  Topic 9. Direct current.  Content module 3. Magnetism.  Topic 10. Magnetic field in vacuum.  Topic 11. Electromagnetic induction.  Topic 12. Magnetic field in matter.  Topic 13. Electromagnetic field.  Topic 14. Electromagnetic oscillations and alternating current.

Content module 4. Waves and optics. Elements of quantum mechanics   Topic 15. Electromagnetic waves.   Topic 16. Wave optics.   Topic 16. Wave optics.   Topic 18. Bohr's theory of the structure of the hydrogen atom.   Topic 19. Elements of quantum mechanics.   Topic 18. Bohr's theory of the structure of the hydrogen atom.   Topic 19. Elements of quantum mechanics.   General competencies:   General competencie						
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Lw №3 Control lesson       5 9         Pc №1       3 5         Pc №2       3 5         Pc №3       3 5         Test       8 13         Checkpoint 1       26 43         Lw №4       2 3         Lw №5       2 3         Lw №6 Control lesson       5 9         Pc №4       3 5         Pc №5       3 5         Test       7 12         Test paper       12 20         Checkpoint 2       34 57					2	
Pc Noll       3 5         Pc Noll       3 5         Pc Noll       3 5         Pc Noll       3 5         Test       8 13         Checkpoint 1       26 43         Lw Noll       2 3         Lw Noll       2 3         Lw Noll Control lesson       5 9         Pc Noll       3 5         Pc Noll       3 5         Test       7 12         Test paper       12 20         Checkpoint 2       34 57					- 0	
Pc $N_{0}2$ 3 5         Pc $N_{0}3$ 3 5         Test       8 13         Checkpoint 1       26 43         Lw $N_{0}4$ 2 3         Lw $N_{0}5$ 2 3         Lw $N_{0}6$ Control lesson       5 9         Pc $N_{0}4$ 3 5         Pc $N_{0}5$ 3 5         Test       7 12         Test paper       12 20         Checkpoint 2       34 57					2 5	
Pc №3       3       5         Test       8       13         Checkpoint 1       26       43         Lw №4       2       3         Lw №5       2       3         Lw №6 Control lesson       5       9         Pc №4       3       5         Pc №5       3       5         Test       7       12         Test paper       12       20         Checkpoint 2       34       57					2 5	
Checkpoint 1       26        43         Lw No4       2        3         Lw No5       2        3         Lw No6 Control lesson       5        9         Pc No4       3        5         Pc No5       3        5         Test       7        12         Test paper       12       20         Checkpoint 2       34        57				Pc №3	3 5	
Lw No4       2       3         Lw No5       2       3         Lw No6 Control lesson       5       9         Pc No4       3       5         Pc No5       3       5         Test       7       12         Test paper       12       20         Checkpoint 2       34       57				Test	8 13	
Lw No       2       3         Lw No       6 Control lesson       5       9         Pc No       3       5         Pc No       3       5         Test       7       12         Test paper       12       20         Checkpoint 2       34       57				Checkpoint 1	26 43	
Lw No6 Control lesson       5       9         Pc No4       3        5         Pc No5       3        5         Test       7        12         Test paper       12       20         Checkpoint 2       34        57						
Pc $N_{0}4$ 3 5         Pc $N_{0}5$ 3 5         Test       7 12         Test paper       12 20         Checkpoint 2       34 57						
Pc №5       3 5         Test       7 12         Test paper       12 20         Checkpoint 2       34 57						
Test         7 12           Test paper         12 20           Checkpoint 2         34 57						
Test paper 12 20 Checkpoint 2 34 57						
Checkpoint 2 34 57						
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Total for the semester 60 100				•	(0 100	
				1 otal for the semester	60 100	

Semester 2

Control measure	Rati	ng C	sem
Lw №1	2		3
Lw №2	2		3
Pc <b>№</b> 1	3		5
Pc <b>№</b> 2	3		5
Test			16
Checkpoint 1	24		32
Lw №3	2		3
Lw №4 Control lesson	12		20
Pc №3	3		5
Pc №4	3		5
Test	12		15
Test paper	12		20
Checkpoint 2	36		68
<b>Total for the semester</b>	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  $O_{sem} - \text{grade}$  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 s	ECTS scale score	
	exam	credit	
96-100	5 (perfectly)	passed	A
90-95	5 (perfectly)		В
75-89	4 (good)		С
66-74	3 (satisfactorily)		D
60-65	3 (satisfactorily)		Е
35-59	2 (unsatisfactorily)	not passed	FX
1-34			F

14. The quality of the educational process

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

15. Methodical support

#### **Basic literature**

- 1. General Physics with Examples and Problems. Mechanics: A Textbook for Students of All Specialties and Forms of Study [Electronic Resource] / Compiled by: A.I. Rybalka et al. Kharkiv: KhNURE, 2024. 220 p.
- 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 / IM Kibets and others H.: SMITH Company,	
		2012 232p.	
		Supporting literature	
		1. Collection of tests from the course of physics / O.M. Kovalenko	
		and others Kharkiv: KNURE, 2006. –124s.	
		2. Dictionary of physical terms: textbook / TB Tkachenko Kharkiv:	
		KNURE, 200480p.	
		,	
		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,	
		2013152p.	
		2. Methodical instructions for software in physics (part 2) / Edited	
		by: VO Storozhenko and others. –Kharkiv: KhNURE, 2013140p.	
		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./	
		Edited by: R. P. Orel, O. M. Kovalenko, A. I. Rybalka and others -	
		Kharkiv: Khnure, 2021 132	
		Information support:	
		1. https://physic.nure.ua.	
		2. <a href="https://catalogue.nure.ua/knmz/?subdivision=24&amp;level=0&amp;quer">https://catalogue.nure.ua/knmz/?subdivision=24&amp;level=0&amp;quer</a>	
		<u>y=undefined</u>	
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		olena.kovalenko@nure.ua	