

# PHYSICS

## COURSE SYLLABUS

Code and name of specialty	121 - Software Engineering	Institute	Computer Sciences and Software Engineering
Program name	"Software Engineering"	Department	Software Engineering and Management Information Technologies
Type of program	Educational and Professional	Language of instruction	Ukrainian

## LECTURER

Hryhorii Nikolaichuk

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PhD, Candidate of Physical and Mathematical Sciences, Associate Professor of Department of Physics, NTU "KhPI". Author of more than 120 scientific and educational publications.

Scopus ID – 10039435200 h-index – 2. [https://www.scopus.com/authid/detail.uri?origin=resultslist&authorId=10039435200&zone=](https://www.scopus.com/authid/detail.uri?origin=resultslist&authorId=10039435200&zone=WoS)

WoS h-index – 1 <https://www.webofscience.com/wos/woscc/summary/70e69c4c-ac3b-4766-b2ad-61b9654d4545-0a8e2e12/relevance/1>

Google Scholar h-index = 5, i10-index = 2.

[https://scholar.google.com.ua/citations?hl=ru&user=xAsHnkwAAAAJ&view\\_op=list\\_works&sortby=pubdate](https://scholar.google.com.ua/citations?hl=ru&user=xAsHnkwAAAAJ&view_op=list_works&sortby=pubdate)

Lecturer in the courses "Physics" and "General Physics"

## GENERAL DESCRIPTION OF THE COURSE

Summary	The course "Physics" is a discipline in the cycle of special compulsory training in the specialty 121 "Software Engineering". It is taught in the first semester in the amount of 120 hours (4 ECTS credits), in particular: lectures - 48 hours, practical classes - 16 hours, independent work - 56 hours. Calculation-graphic and individual tasks are provided. The study of the discipline ends with an exam						
Course objectives	Acquisition by students of knowledge and skills to establish and explain the physical laws according to which processes take place in the modern one computer technology, which will understand the organization of computers and various semiconductor elements of modern integrated circuits.						
Types of classes and control	Lectures, practical classes, control work, independent work, calculation task, consultations. Final control - exam.						
Term	1						
Student workload (credits) / Type of course	4 / mandatory	Lectures (hours)	48	Workshops (hours)	16	Self-study (hours)	56
Program competences	GC01. Ability to abstract thinking, analysis and synthesis GC05. Ability to learn and master modern knowledge PC20. Ability to apply fundamental and interdisciplinary knowledge to successfully solve software engineering problems software						

Learning outcomes	Teaching and learning methods	Forms of assessment (continuous assessment CAS, final assessment FAS)
PRN01 Analyze, purposefully search for and select the necessary information and reference resources and knowledge to solve professional problems, taking into account modern advances in science and technology.	Interactive lectures with presentations, discussions, practical classes, teamwork, case method, method of feedback from students, problem-based learning	Current assessment of CAS: Assessment of students' work in the process of practical classes. Intermediate modular control. Final evaluation of FAS: Exam.

### ASSESSMENT AND GRADING

Ranges of points corresponding to grades	Total score (points) for all types of learning activities	ECTS grading scale	The national grading scale	Allocation of grade points
	90-100	A	excellent	
	82-89	B	good	
	74-81	C	satisfactory	
	64-73	D		
	60-63			
	35-59	FX	Unsatisfactory (with the exam retake option)	
	0-34	F	Unsatisfactory (with mandatory repetition of the course)	

100% final evaluation in the form exam (40%) and current evaluation (60%).  
40% exam:  
60% current rating:

<b>Course policy</b>	Follow the rules of the University internal regulations. Take an active part in the learning process. Students must attend all classes according to the study schedule and adhere to the norms of academic ethics. To study the course, students need to have their personal computer and (or) use computers of the computer center at the department. Students must work with compulsory and recommended reading, including Internet resources. The final assessment is not carried out without the personal presence of students.
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### COURSE STRUCTURE AND CONTENT

Lectures 1-2	Coulomb's law. Electric field. Gauss's theorem.	Practical lesson 1	Electric field strength.	Self-Study
Lectures 3-4	Electric potential.	Practical lesson 2	Potential. High-voltage.	
Lectures 5-6	Capacitors. Electric field energy.	Practical lesson 3	Capacitors. Electric field energy.	
Lectures 7-10	Direct current. Magnetic field. Ampere's law. Lorentz force.	Practical lesson 4	Magnetic field of various systems.	

Calculation of electric fields by the method of superposition.  
Voltage calculation in various charged systems.  
Conductors and dielectrics in an electric field.  
Electric current in vacuum and gas. The concept of plasma. Magnetic field in matter.  
Classification of magnets.

<b>Lectures 11-12</b>	Electromagnetic induction. Magnetic field energy.	<b>Practical lesson 5</b>	Charges and current in a magnetic field.	Electromagnetic field.
<b>Lectures 13-16</b>	Own and non-own semiconductors. P-n junction.	<b>Practical lesson 6</b>	Electromagnetic induction. Magnetic field energy.	Structure of semiconductor atoms. Zone theory of solids. Methods of obtaining p-n junction.
<b>Lectures 17-22</b>	Types of diodes. Bipolar and unipolar transistors.	<b>Practical lesson 7</b>	Electromagnetic oscillations.	Fiber LEDs. Solar panels. Semiconductor lasers .. Methods of obtaining bipolar and unipolar transistors.
<b>Lectures 23-24</b>	Integrated circuits. Processors. Memorable general devices.	<b>Practical lesson 8</b>	Modular control work.	Types of integrated circuits, processors and storage devices.

### RECOMMENDED READING

<b>Compulsory</b>	<p>1. Kucheruk, I. M., Gorbachuk, I. T., Lucik, P. P. (2006). General course of physics: in 3 volumes . Vol.2. Electricity and magnetism. Kyiv: Tekhnika,.</p> <p>2. Garkusha, I. P. (2004). General course of physics: a collection of problems / ed. 2nd ed., Ster.- Kyiv: Tekhnika.</p> <p>3. Mamaluy, A. O., Lebedeva, M. V., Pilipenko, V. V. (2014). General physics. Practical tasks: teaching method. Mamaluya. Kharkiv: Publishing house "Pidruchnyk NTU "KhPI.</p> <p>4. Prischepa, M. M., Pogrebnyak, V. P., Grafts Ed. M. M. (2004). Microelectronics: In 3 hours Part 1. Elements of microelectronics. Kyiv: Vyshcha shk.</p> <p>5. Prischepa, M. M, Pogrebnyak, V. P., Ed. M. M. Grafts. (2006). Microelectronics: In 3 hours Part 2. Elements of microcircuitry. Kyiv: Vyshcha shk.</p> <p>6. Prischepa, M. M., Pogrebnyak, V.P., Ed. M. M. Grafts. (2006). Microelectronics: In 3 hours Part 3. Elements of chips. Collection of problems. Kyiv: Vyshcha shk.</p> <p>7. Nikolaichuk, G. P. (2020). Physics of semiconductors and semiconductor devices: Textbook. Kharkiv: NTU "KhPI. Retrived from: <a href="http://repository.kpi.kharkov.ua/handle/KhPI-Press/47113">http://repository.kpi.kharkov.ua/handle/KhPI-Press/47113</a></p>	<b>Recommended</b>	<p>1. Vetchinkina, Z. K., Dzyubenko, N. I., Lyubchenko, O. A., Tavrina, T. V. (2010). Methodical instructions for solving problems on the topic "Electromagnetism. Part I. Electricity "from the course" General Physics "for students of all specialties and all forms training. Compiled by Kharkiv: NTU "KhPI".</p> <p>2. Burlakova, M. V., Vetchinkina, Z. K., Dzyubenko, N. I., Ledenyov, V. V., Lyubchenko, O. A., Tavrina, T. V. (2010). Methodical instructions for solving problems on the topic "Electromagnetism. Part II. Magnetism "from the course" General Physics "for students of all specialties and all forms training. Compiled by: Kharkiv: NTU "KhPI".</p> <p>3. Vetchinkina, Z. K., Lyubchenko, O. A., Tavrina, T. V. (2016). Electricity and magnetism: teaching method. Allowance. Kharkiv: NTU "KhPI".</p> <p>4. Nikolaichuk, G. P. (2018). Physics of semiconductors and semiconductor devices: textbook. Kharkiv: NTU "KhPI". Retrived from: <a href="http://repository.kpi.kharkov.ua/handle/KhPI-Press/38251">http://repository.kpi.kharkov.ua/handle/KhPI-Press/38251</a></p> <p><b>INFORMATION RESOURCES ON THE INTERNET</b></p> <p><a href="http://web.kpi.kharkov.ua/tef/pidruchniki-i-navchalni-posibniki/">http://web.kpi.kharkov.ua/tef/pidruchniki-i-navchalni-posibniki/</a></p>
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### ACADEMIC INTEGRITY

Students are expected to adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI".

The content of this syllabus is consistent with the course program.