



## Syllabus Course Program

# PHYSICS (part 1)

**Specialty**

161 Chemical technologies and engineering

**Institute**

Institute of Computer Modeling, Applied Physics and Mathematics

**Educational program**

Technology of oil, gas and solid fuel refining

**Department**

Physics (168)

**Level of education**

Bachelor's level

**Course type**

Special (professional), Mandatory

**Semester**

1

**Language of instruction**

English

## Lecturers and course developers

**Olga Vodoriz**

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Candidate of physical and mathematical sciences (PhD), Associate Professor of the Physics Department.

Author of more than 90 scientific and educational publications.

Lecturer in the courses "Physics".

[More about the lecturer on the department's website](#)

## General information

### Summary

The course of physics acquaints with the fundamental concepts, laws and theories of classical and modern physics, the basic methods of solving physical problems, and the features of physical processes. This will ensure the effective mastery of special disciplines and further possibility of using physical principles in professional activity in the field of chemical technologies. The course covers the following sections of physics as a fundamental discipline that forms a complete picture of the modern world: the physical fundamentals of mechanics, mechanical oscillations and waves, foundations of molecular physics and thermodynamics, electricity. During the study of basic laws and phenomena, students acquire skills of learning the laws of physics in practice, summarize and analyze the results of physical experiments to apply in the field of chemical technologies.

### Course objectives and goals

The goals of the course are to provide future graduates with basic knowledge of physics; to form the skills of understanding the physical content of engineering problems; to develop the ability to practically apply fundamental knowledge of physics for the specialty of chemical technologies and engineering.

### Format of classes

Lectures, laboratory classes, self-study, consultations.

Final assessment is an exam.

## Competencies

C01. Ability to abstract thinking, analysis and synthesis.  
C02. Ability to apply knowledge in practical situations. ]

## Learning outcomes

PR01. Know mathematics, physics and chemistry at the level necessary to achieve the results of the educational program. ]

## Student workload

The total volume of the course is 120 hours (4 ECTS credits): lectures - 32 hours, laboratory classes - 16 hours, self-study - 72 hours. ]

## Course prerequisites

Complete secondary education ]

## Features of the course, teaching and learning methods, and technologies

Lectures are conducted interactively using multimedia technologies. Laboratory classes use problem-based learning, teamwork, feedback method from students. ]

## Program of the course

### Topics of the lectures

Topic 1. Introduction to the course.  
Topic 2. Elements of particle kinematics.  
Topic 3. Dynamics of material point.  
Topic 4. A solid body in mechanics and the laws of its motions.  
Topic 5. Work and energy.  
Topic 6. Mechanical oscillations.  
Topic 7. Wave processes.  
Topic 8. Fundamentals of molecular kinetic theory of gases.  
Topic 9. Fundamentals of thermodynamics.  
Topic 10. Transference phenomena.  
Topic 11. Electrostatics in a vacuum.  
Topic 12. Conductors and dielectrics in an electrostatic field.  
Topic 13. Direct electric current. ]

### Topics of the workshops

Workshops works are not provided within the discipline ]

### Topics of the laboratory classes

Topic 1. Processing of experimental results and estimation of measurement error.  
Topic 2. Physical foundations of mechanics.  
Topic 3. Mechanical oscillations and waves.  
Topic 4. Molecular physics and thermodynamics.  
Topic 5. Electricity. ]

### Self-study

Students are recommended additional materials (lecture notes, laboratory manuals) for independent work. ]

## Course materials and recommended reading

### Compulsory materials

1. Lyubchenko O. A. Kinematics: lecture notes. - Kharkiv: NTU "KhPI", 2022. - 8 p. URL: <http://web.kpi.kharkov.ua/tef/educational-material-in-english-ua/>
2. Lyubchenko O. A. Dynamics: lecture notes. - Kharkiv: NTU "KhPI", 2022. - 26 p. URL: <http://web.kpi.kharkov.ua/tef/educational-material-in-english-ua/>
3. Lyubchenko O. A. Oscillations and waves: study guide. - Kharkiv: NTU "KhPI", 2022. - 63 p. URL: <http://web.kpi.kharkov.ua/tef/educational-material-in-english-ua/>
4. Lyubchenko O. A. Electricity: lecture notes - Kharkiv : NTU "KhPI", 2022. - 41 p. URL: <http://web.kpi.kharkov.ua/tef/educational-material-in-english-ua/>
5. Lyubchenko O. A. – Physics. Laboratory manual. - Kharkiv : NTU "KhPI", 2022. - 62 p. URL: <http://web.kpi.kharkov.ua/tef/educational-material-in-english-ua/>

### Additional materials

1. College Physics for AP® Courses 2ed (2022) by OpenStax <https://openstax.org/details/books/college-physics-ap-courses-2e?Book%20details>
2. Foundations of Physics by Terrance Berg (2023) <https://opentextbc.ca/foundationsofphysics/>
3. Douglas College Physics 1104 (Summer 2021) by Department of Physics and Astronomy at Douglas College and OpenStax <https://pressbooks.bccampus.ca/douglasphys1104summer2021/>
4. [https://openlearning.mit.edu/courses-programs/open-learning-library?f%5B0%5D=open\\_moocs\\_departments%3A34](https://openlearning.mit.edu/courses-programs/open-learning-library?f%5B0%5D=open_moocs_departments%3A34). |

## Assessment and grading

### Criteria for assessment of student performance, and the final score structure

The final grade can be assigned either by exam results (100%) or as a result of accumulation (100%) during the semester.

Exam: written assignment (2 questions on theory and 1 problem- 30% each) and oral answer - 10%.

Accumulation during the semester: oral answers during practical classes (10%), testing (10%), completion of tasks from individual modules (80%).

The final grade based on the results of the accumulation is given on the eve of the session, which the teacher informs the applicant about. The applicant, at his/her request, may increase the grade received in the accumulation at the exam

### Grading scale

Total points	National	ECTS
90–100	Excellent	A
82–89	Good	B
75–81	Good	C
64–74	Satisfactory	D
60–63	Satisfactory	E
35–59	Unsatisfactory (requires additional learning)	FX
1–34	Unsatisfactory (requires repetition of the course)	F

## Norms of academic integrity and course policy

The student must adhere to the Code of Ethics of Academic Relations and Integrity of NTU "KhPI": to demonstrate discipline, good manners, kindness, honesty, and responsibility. Conflict situations should be openly discussed in academic groups with a lecturer, and if it is impossible to resolve the conflict, they should be brought to the attention of the Institute's management.

Regulatory and legal documents related to the implementation of the principles of academic integrity at NTU "KhPI" are available on the website: <http://blogs.kpi.kharkov.ua/v2/nv/akademichna-dobrochesnist/> |

## Approval

Approved by

30.08.2023



Head of the department  
Olena LYUBCHENKO

30.08.2023

Guarantor of the educational  
program  
Iryna SENKEVYCH