



COURSE SYLLABUS

« Mathematics and physics (physics) »

Degree of higher education - Bachelor

Specialization 101 « Ecology »

Educational programme « Ecology »

Academic year 2023/2024, **semester** 1

Form of study full-time (full-time, part-time)

Number of ECTS credits 2,0

Language of instruction English (Ukrainian, English, German)

Lecturer of the course

candidate of physical and mathematical sciences, associate professor Oksana Godlevska

Contact information of the lecturer (e-mail)

godlevok@gmail.com

Course page on eLearn

<https://elearn.nubip.edu.ua/course/view.php?id=2805>

COURSE DESCRIPTION

(up to 1000 printed characters)

The discipline "Mathematics and Physics" is one of the main parts of the theoretical training of bachelors in the specialty 101 "Ecology, Environmental Protection and Balanced Nature Management", that is, the basis without which a full study of the disciplines of the cycle of professional and practical training of such specialists is impossible.

The Purpose of studying the discipline "Physics" is the consistent study by students of the basic laws and provisions of physics in order to understand the general regularities of natural phenomena; the use of these laws in the prompt resolution of problems; illumination of possible applications of physical methods and devices in practical activities.

The tasks of the academic discipline "Physics" are as follows:

Providing students with sufficiently broad training in the field of physics, mastery of fundamental concepts and theories of classical and modern physics, which provides them with effective mastery of special subjects and the further possibility of using physical principles. This also includes teaching students methods and skills for solving specific problems and familiarizing them with measuring equipment. Formation of students' scientific outlook and modern physical thinking. This task should also be considered as an essential part of the humanitarian training of the future specialist, since most issues of the history of science and philosophy can be demonstrated during the teaching of a physics course. As a result of studying the academic discipline "Mathematics and Physics", the student should

know:

basic physical quantities, units of their measurements, basics of error theory and rules for processing measurement results, modern means of measuring physical quantities

- fundamental concepts and theories of classical and modern physics in order to effectively master special educational disciplines and use knowledge of physical laws in future work;

- methods of solving practical physical problems and problems;

- principles of operation of devices;

be able to: - use measuring tools, perform mathematical and statistical processing of measurement results;

- using physical conditions, laws and theories, apply the acquired theoretical and practical knowledge after studying special disciplines in the future work in the specialty;

- explain physical processes and phenomena that occur in the natural environment, as well as during the operation of various types of equipment.

Acquisition of competencies

The study of the academic discipline "Mathematics and Physics" contributes to the fact that, according to this standard, the student is able to acquire:

general competencies:

GC8 Ability to conduct research at the appropriate level.

professional (special) competences:

SC2. Ability to critically understand basic theories, methods and principles of natural sciences

SC3. Understanding the main theoretical provisions, concepts and principles of mathematical and socio-economic sciences.

Program learning outcomes (PLO):

PLO3. Understand the main concepts, theoretical and practical problems in the field of natural sciences, which are necessary for analysis and decision-making in the field of ecology, environmental protection and balanced nature management

PLO19. To raise the professional level through continuing education and self-education.

COURSE STRUCTURE

Names of content modules and topics	Hours (lectures/ practical/ Self exercises	Learning outcomes	Tasks	Assess- ment
2 semester				
Module 1				
Topic 1. Mathematical data processing	1/0/1	Know and understand the basics of mathematical analysis, elements of differential and integral calculations	Study of theoretical material based on lecture notes and literary sources.	
Topic 2. Kinematics of a material point.	1/0/1	Know and understand the basic concepts and formulas of kinematics.	Study of theoretical material based on lecture notes and literary sources.	

Topic .3. Dynamics of a material point.	1/2/3	Know and understand the basic concepts and laws from the "Dynamics" section; be able to measure, calculate experimental errors; to be able to record the results of measurements according to current standards using the SI system of units.	Study of theoretical material based on lecture notes and literary sources. Practical exercise "Determining the acceleration of free fall using a mathematical pendulum"	20
Topic 4. Work and energy	1/2/3	Know and understand the definition and use of physical quantities of work, power, kinetic and potential energy, gravity, elasticity, friction.	Study of theoretical material based on lecture notes and literary sources.	
Topic 5. Dynamics of rotary motion.	1/2/3	Know and understand the definition and use of dynamic characteristics of solid bodies during rotational motion.	Study of theoretical material based on lecture notes and literary sources. Practical exercise "Determining the moment of inertia by the method of torsional oscillations"	20
Topic 6. Basics of hydrodynamics and aerodynamics	1/0/1	Know and understand the laws of motion of an ideal and viscous fluid. Distin-	Study of theoretical material based on lecture notes and literary	20

		guish laminar and turbulent flow. The phenomenon of surface tension.	sources. Self exercise 1.	
Topic 7. Molecular-kinetic theory of ideal gases.	1/0/1	To know and understand the laws of an ideal gas, the relationship between temperature and the kinetic energy of particles, the physical meaning of the concept of internal body energy.	Study of theoretical material based on lecture notes and literary sources. Practical exercise «Determination of liquid surface tension coefficient by the method of drop separation».	20
Topic 8. Basics of thermodynamics	1/2/2	Know and understand the first law of thermodynamics, its notation for various isoprocesses, the concept of heat capacity and its use, an adiabatic process and the equation that describes it in an ideal gas.	Study of theoretical material based on lecture notes and literary sources. Colloquium on practical exercises. Control exercise from Module 1	20
Total for Module 1	8/8/15			100
		Module 2		
Topic 9. Electrostatics	1/2/3	To know and understand the main properties of electric charges, Coulomb's law, force and energy characteristics of an electric field, methods of graphic representation of the field,	Study of theoretical material based on lecture notes and literary sources. Practical exercise «Determination of electromotive force of the current source by the method of	20

		electric capacity of a conductor and a capacitor.	compensation».	
Topic 10 Direct electric current.	1/0/1	Know and understand the definition of electric current, its strength and density, the definition of electromotive force, current sources; Ohm's law, dependence of resistance on temperature; definition of work and power of electric current, Joule-Lenz law.	Study of theoretical material based on lecture notes and literary sources.	
Topic 11 Magnetic field.	1/2/3	Know and understand: the main properties and characteristics of the magnetic field; formulas that describe the forces acting on bodies from the side of the magnetic field; Biot-Savard-Laplace law and its application. Magnetic fields of a ring conductor and a solenoid	Study of theoretical material based on lecture notes and literary sources. Practical exercise "Determination of the horizontal component of the induction of the Earth's magnetic field.".	20
Topic 12 The phenomenon of electromagnetic induction.	1/0/1	Know and understand: the main properties of the phenomenon of electromagnetic induction, Faraday's law, Lenz's rule, the phenome-	Study of theoretical material based on lecture notes and literary sources.	

		non of self-induction.		
Тема 13 Гармонічні коливання.	1/0/1	Know and understand: equations and characteristics of harmonic oscillations; harmonic oscillations of a mathematical pendulum; dynamics of mechanical harmonic oscillations	Study of theoretical material based on lecture notes and literary sources. Self exercise 2.	20
TOPIC 14. Waves. Geometric optics	1/2/3	Know and understand: wave characteristics and equations; properties of electromagnetic waves; laws of reflection and refraction of light, absolute and relative indices of refraction. The phenomenon of total internal reflection.	Study of theoretical material based on lecture notes and literary sources. Practical exercise "Determining the index of refraction using a microscope."	20
TOPIC 15. Physics of the atom and atomic nucleus.	1/1/3	Know and understand: Rutherford's model of the atom, Bohr's postulates, the composition of the nucleus, nuclear forces, the phenomenon of radioactivity, the law of radioactive decay, nuclear fission and nuclear fusion as a source of	Study of theoretical material based on lecture notes and literary sources. Colloquium on practical exercises. Control exercise from Module 2.	20

		energy.	
Total 2 modules	7/7/15		100
Total for 1 semester	15/15/30		70
Exam			30
Total hours			100

ASSESSMENT POLICY

<i>Policy regarding deadlines and resits:</i>	Assignments submitted after the deadline without valid reasons will be graded lower. Resitting of modules will be allowed with the permission from the lecturer and in the presence of valid reasons (e.g. medical reasons).
<i>Academic honesty policy:</i>	Cheating during tests and exams is strictly prohibited (including the use of mobile devices). Coursework and research papers must contain correct citations for all sources used.
<i>Attendance policy:</i>	Class attendance is mandatory. In case of objective reasons (such as illness or international internships), individual learning may be allowed (in online format by the approval of the dean of the faculty).

SCALE OF ASSESSMENT OF STUDENT KNOWLEDGE

Student rating, points	National grade based on exam results	
	exams	credits
90-100	excellent	passed
74-89	good	
60-73	satisfactory	
0-59	unsatisfactory	not passed

Recommended sources of information

1. Фізика : підручник для вищих навчальних закладів / Бойко В.В., Булах Г.І.; Гуменюк Я.О., Ільїн, П.П. Національний університет біоресурсів і природокористування України. – К.: "Ліра-К", 2019. – 468 с.

2. Бойко В.В., Булах Г.І., Гуменюк Я.О., Ільїн П.П.; Сукач Г.О. Фізика : Частина II. Електромагнетизм. Електромагнітні коливання та хвилі. Оптика. Елементи квантової фізики, фізики твердого тіла, атома та ядра. навчальний посібник для студентів нефізичних спеціальностей ВНЗ / за ред. В. В. Бойка ; Національний університет біоресурсів і природокористування України. – К. : ВЦ "АЗБУКА", 2020. – 319 с.

3. Біофізика : підручник для студентів вищих навчальних закладів III-IV рівнів акредитації / Посудін Ю.І.; Бойко В.В.; Годлевська О.О.; Залоїло І.А. Національний університет біоресурсів і природокористування України. - К. : Ліра-К, 2020. - 704 с.

4. Навчальний посібник «Практикум з біофізики. Ч.1» (Бойко В.В., Залоїло І.А., Годлевська О.О., Посудін Ю.І.), Національний університет біоресурсів і природокористування України. - К. : Ліра-К, 2021. - 570 с.

5. Годлевська О.О. Методичні вказівки до виконання лабораторно-практичних робіт «Основи біофізики» для студентів вищих аграрних навчальних закладів III-IV рівнів акредитації з напрямів «Екологія та охорона навколишнього середовища», «Екобіотехнологія», «Захист рослин» 2020,-160 стор.

6. V. Boyko, O. Godlevska, P. Iiin, M. Maluyuta. "Physics". Methodical recommendations for the students, who attend the English-speaking lectures.-2022, printed NULE of Ukraine, Kyiv , p.52.

7. V. Boyko, P. Iiin, O. Godlevska Навчально-методичні рекомендації: Methodical recommendations for performing laboratory work remotely who attend the English-speaking lectures, 2023, printed NULE of Ukraine, Kyiv ,p. 247.

Internet sources

1. Канал Youtube «КАФЕДРА ФІЗИКИ НУБІП УКРАЇНИ»

<https://www.youtube.com/channel/UCUQ-x3dx5Lw2SL6w9a6DNDg>.

Дата звернення: 20.01.2024

2. Portal: Physics – Wikipedia

URL: <https://en.wikipedia.org/wiki/Portal:Physics>

дата звернення: 20.01.2024