COURSE SYLLABUS

Physics

Degree of higher education - Bachelor

Specialization 162 "Biotechnologies and bioengineering"
Educational programme Biotechnologies and bioengineering _____»
Academic year _2023/2024_____, semester _____1____
Form of study _____full-time_____(full-time, part-time)
Number of ECTS credits__2_____
Language of instruction _____ English _____(Ukrainian, English, German)

Лектор курсу	**candidate of physical and mathematical sciences, associate professor Oksana Godlevska**
Контактна інформація лектора (e-mail)	**godlevok@gmail.com**
Сторінка курсу в eLearn	**https://elearn.nubip.edu.ua/course/view.php?id=3659**

COURSE DESCRIPTION

The main objective of the course "Physics" is to expose principal laws and theses of physics which make it possible to study general regularities of natural phenomena; to apply the principles and methods of the physical sciences to biological problems; to consider the biophysical problems which are concerned with the viability of agricultural objects and their interaction with the environment; to elucidate possible application of physical instrumentation to practice.

The main requirements to the student after studying by him the course "Physics" are the following:

The student must know

the main physical quantities and units, principal laws and theses of general physics, theory and practice of measurement errors;

general physical processes and phenomena which take place in the living organism;

the effects of external physical factors on agricultural objects and their interaction with the environment;

possibility of the application of physical instrumentation to future practice.

The student must be able

to process experimental data and estimate measurement errors;

to explain physical principles and mechanisms of function of living organism;

to use modern physical methods and devices in future practice.

Acquisition of competencies

The study of the academic discipline "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.

GK10 Ability to evaluate and ensure the quality of performed works.

professional (special) competences:

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

Program learning outcomes (PLO):

PLO21. Be able to choose optimal methods and tools for research, data collection and processing.

COURSE STRUCTURE

Names of content modules and topics	Hours (lectures/ laboratory /	Learning outcomes	Tasks	Assessment
1 semester				
Module 1				
Topic 1. Mathematical data processing	**1/0**	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**	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.	**1/4**	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	**1/4**	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.	**1/4**	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**	Know and understand the laws of motion of an ideal and viscous fluid. Distinguish laminar and turbulent flow. The phenomenon of surface tension.	Study of theoretical material based on lecture notes and literary sources. Self exercise 1.	**20**
Topic 7. Molecular-kinetic theory of ideal gases.	**1/2**	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**	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	**8/16**			**100**
		Module 2		

Topic 9. Electrostatics	**1/4**	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, electric capacity of a conductor and a capacitor.	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 compensation».	**20**
Topic 10 Direct electric current.	**1/0**	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.	**1/4**	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	Study of theoretical material based on lecture notes and literary sources. Practical exercise "Determination of the horizontal component of	**20**

		and its application. Magnetic fields of a ring conductor and a solenoid	the induction of the Earth's magnetic field.".	
Topic 12 The phenomenon of electromagnetic induction.	**1/0**	Know and understand: the main properties of the phenomenon of electromagnetic induction, Faraday's law, Lenz's rule, the phenomenon of self-induction.	Study of theoretical material based on lecture notes and literary sources.	
Тема 13 Гармонічні коливання.	**1/2**	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**	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	Study of theoretical material based on lecture notes and literary sources. Practical exercise "Determining the index of refraction using a microscope."	**20**

		phenomenon of total internal reflection.		
TOPIC 15. Physics of the atom and atomic nucleus.	**1/2**	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 energy.	Study of theoretical material based on lecture notes and literary sources. Colloquium on practical exercises. Control exercise from Module 2.	**20**
Total 2 modules	**7/14**			**100**
Total for 1 semester	**15/30**			**70**
Exam				**30**
Total hours				**100**

ASSESSMENT POLICY

Policy regarding deadlines and resits:	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).
Academic honesty policy:	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.
Attendance policy:	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

Posudin Yuriy. *Physics with Fundamentals of Biophysic*.- 2d edition.- Kyiv: Printline, 2014.- 209 p.

Physics\ V. Boyko, O. Godlevska, P.Iliin, M. Malyuta\\ Methodical recommendations for the students, who attend the English-speaking lectures, printed NULE of Ukraine, Kyiv. 2021, p.52

Посудін Ю.І. *Лабораторний практикум з дисципліни «Фізика з основами біофізики» для студентів, що слухають лекції англійською мовою*. К.: 2010.-194 с. (для англомовних груп).

Бойко В.В., Відьмаченко А.П., Залоїло І.А., Малюта М.В. Фізика з основами кваліметрії: Навчальний посібник. - К.: Видавництво «Ліра– К», 2018, – 564 с.

Практикум з біофізики : навчальний посібник для вищих навчальних закладів. Ч. І. Біомеханіка / В. В. Бойко, І. А. Залоїло, О. О. Годлевська. - К.: , 2021. - 572 с.

Посудін Ю.І. Фізика з основами біофізики. Київ, Світ, 2003.-400 с.

Посудін Ю.І. Лабораторний практикум з дисципліни "Фізика з основами біофізики": Навчальний посібник - Київ, НУБіПУ, 2012.-105 с.