Bachelor program,
Fundamental of Physics program, "Physics" department

Course Unit Title	Fundamental of Physics
Course Unit Code	VTSS-B04
Type of Course Unit	Compulsory
Level of Course Unit	1 st year INEN program
National Credits	0
Number of ECTS Credits Allocated	5
Theoretical (hour/week)	2
Practice (hour/week)	1
Laboratory (hour/week)	1
Year of Study	1
Semester when the course unit is delivered	2
Course Coordinator	Behbud İbrahimov
Name of Lecturer (s)	Behbud İbrahimov
Name of Assistant (s)	-
Mode of Delivery	Face to Face
Language of Instruction	English
Prerequisites	-
Recommended Optional Programmer Components	-

Course description:
Physics is a science that studies the simplest and at the same time the most general laws of the phenomena of nature, the properties and structure of matter and the laws of its motion. Physical theory is a system of basic ideas that generalize experimental data and reflect the objective laws of nature. Physical theory provides an explanation for a whole range of phenomena of nature from a single point of view. Physics has a huge impact on technology.

Objectives of the Course:
The main goal of the teaching of the subject is theoretical and practical teaching of students the content of physical phenomena and processes according to topics included in the course "Basic Physics" and in the curriculum. Providing theoretical knowledge, future engineers are invited to choose the right directions in the flow of technical information and to form a modern physical and scientific worldview, knowledge and skills of using fundamental laws, theories of classical and modern physics.

Learning Outcomes

At the end of the course the student will be able to		Assessment
1.	The participants have a thorough knowledge and an in-depth understanding of the mechanics. Classification of moment of inertia.	1,3
2.	Understand Oscillations. Kinematics and Dynamics of simple harmonic motion. Using Pendulum device for measuring period and gravitational acceleration.	1,2,3
3.	Understand Motion of perfect fluids. Streamlines and stream tubes. Continuity equation in fluids dynamics. Bernoulli's equation. Viscosity. Classification of Stok's law.	2,3
4.	Understand of Electromagnetism: Interaction between electric charges. Electric force and electric charge. The electrostatic force. The electric field.	2,3
5.	Understand Optics: Interference. Coherence. Maxima and minima for interference pattern. Classification of Young's experience. Interference from two slits.	1,3
6.	Establish Blackbody radiation. Energy quanta. Planck's law. Photons. Photoelectric effect. Wave vs. Particle. De Broglie wavelength of particle. The Compton effects.	1,3

Assessment Methods: 1. Final Exam, 1. Presentation, 1. Midterm exam, 1. Laboratory work, 1. Quiz.

Course's Contribution to Program

		CL
1	Mechanics: Kinematics of translation and rotation motions of ideal particle. Normal and tangential accelerations.	4
2	Mechanical work and power. Variable force work. Work-energy theorem. Conservative and non-conservative forces. Potential energy.	3
3	Oscillations. Kinematics and Dynamics of simple harmonic motion. Physical pendulum. Addition of simple harmonic motion of the same direction and same frequency.	4
4	Motion of perfect fluids. Streamlines and stream tubes. Continuity equation in fluids dynamics. Bernoulli's equation. Viscosity.	5

5	Molecular physics and Thermodynamics: The ideal Gas and Kinetic Theory. The Ideal-Gas Law. Kinetic pressure: the Maxwell distribution. Equipartition theorem.	4
6	First law of thermodynamics. Work in thermodynamics. Internal energy. The number of degrees of freedom of molecules. Heat capacity.	4
7	Electromagnetism: Interaction between electric charges. Electric force and electric charge. The electrostatic force. The electric field.	1
8	The magnetic force. The magnetic field. The magnetic dipole moment. The magnetic force on moving point charge. The Biot-Savart law.	3
9	Optics: Interference. Coherence. Maxima and minima for interference pattern. Young's experience. Interference from two slits.	4
10	Blackbody radiation. Energy quanta. Planck's law. Photons. Photoelectric effect. Wave vs. Particle. De Broglie wavelength of particle. The Compton effects.	4

CL: Contribution Level (1: Very Low, 2: Low, 3: Moderate, 4: High, 5: Very High)

Course Contents

Week	Chapter	Topics	Exam
1	[4], Ch. 6, p.1-2; [1], Ch. 1; [3], Ch. 1,p.1;	**LECTURE**: Mechanics: Kinematics of translation and rotation motions of ideal particle. Normal and tangential accelerations. **LAB**- Introduction to labs	
2	[1], Ch. 10	**LECTURE**: Mechanical work and power. Variable force work. Work-energy theorem. Conservative and non-conservative forces. Potential energy. **SEMINAR**: Example of solving problems on rigid body mechanics	
3	[1], Ch. 5; [3], Ch. 2, p.3;	**LECTURE**: Oscillations. Kinematics and Dynamics of simple harmonic motion. Physical pendulum. Addition of simple harmonic motion of the same direction and same frequency. **LAB-** Determination moment of inertia by the using falling method	
4	[2], Ch. 12, p.1; [4], Ch. 12, p.1;	**LECTURE**: Motion of perfect fluids. Streamlines and stream tubes. Continuity equation in fluids dynamics. Bernoulli's equation. Viscosity. **SEMINAR**: Examples of solving problems on oscillations and fluid mechanics	
5	[1], Ch.3; [2], Ch. 13, p.5; [3], Ch. 2, p.9;	**LECTURE**: Molecular physics and Thermodynamics: The ideal Gas and Kinetic Theory. The Ideal-Gas Law. Kinetic pressure: the Maxwell distribution. Barometric formula. Boltzmann distribution. **LAB**- Determination moment of inertia by the using falling method	
6	[2], Ch. 13, p.1-4; [7], Ch. 7	**LECTURE**: First law of thermodynamics. Work in thermodynamics. Internal energy. The number of degrees of freedom of molecules. Equipartition theorem. Heat capacity. Adiabatic process. Second law of thermodynamics. **SEMINAR**: Examples of solving problems on molecular physics and thermodynamics	
7	[2], Ch. 12, p.2; [1], Ch. 2; [3], Ch. 2, p.4;	**LECTURE**: Electrostatics: Interaction between electric charges. Electric force and electric charge. The electrostatic force. The electric field. Gauss' law and its application. The electrostatic potential. Conductors and insulators. The capacitance of a single conductor. Capacitors. Potential energy of a system of point charges. Energy. Energy density. **LAB**- Determination of viscosity of liquids by Stokes's method	Midterm
8	[2], Ch. 12, p.2;	**LECTURE**: Direct current. Electromotive force. DC circuits. Ohm's law for an inhomogeneous section of a circuits. Kirchhoff's rule. **SEMINAR**-Examples of solving problems on electrocity and magnetism	
9	[2], Ch. 12, p.3; [3], Ch. 2, p.5;	**LECTURE**: The magnetic force. The magnetic field. The magnetic dipole moment. The magnetic force on moving point charge. The Biot-Savart law. The magnetic field of very long and circular circuits. Lorentz' force. The Hall Effect **LAB**- Determination of viscosity of liquids by Stokes's method	
10	[5], Ch. 2, p.1-7;	**LECTURE**: Ampere's law. Full current law. The magnetic field of a solenoid with current. The magnetic flux. Electromagnetic induction. Lenz' law. Self-inductance. Inductance. Solenoid inductance calculation. The currents in closing and opening circuits. Magnetic	

		energy **SEMINAR**-Tutorial from Ampere's law and Magnetic energy	
11	[5], Ch 2, p.8,11	**LECTURE**: Optics: Interference. Coherence. Maxima and minima for interference pattern. Young's experience. Interference from two slits **LAB**- Determination of the resistivity by Ohm's law	
12	[7], Ch. 8,	**LECTURE**: Diffraction. Huygens-Fresnel principle. Fresnel approximation. Fraunhofer diffraction. Diffraction grating **SEMINAR**- exercises from wavelength, speed of light and frequency	
13	[6], Ch 15, p.10;	**LECTURE**: Dispersion. Electronic theory of dispersion. Absorption and scattering of light. Booger's law. Polarization. Malus and Brewster laws. **LAB**- Determination of the resistivity by Ohm's law	
14	[6], Ch 15, p.11;	**LECTURE**: Blackbody radiation. Energy quanta. Planck's law. Photons. Photoelectric effect **SEMINAR-** Examples of solving problems on wave and quantum optics	
15	[6], Ch 16, p.1-4;	**LECTURE**: Wave and Particle. De Broglie wavelength of particle. The Compton effects **LAB**- Determination of the Stefan-Boltzmann constant.	
16			Final exam

Recommended Sources

TEXTBOOK(S)

1. Physics for Scientists and Engineers. R.A.Serway, J.W.Jewett. 9th edition.
2. College Physics. J.D. Wilson, A.J. Buffer. 4th edition.
3. Physics. D.C.Giancoli. 7th edition.
4. Laboratories on physics. ASOIU.

Assessment

Attendance	0%	Less than 75% class attendance results in NA grade
Presentation	10%	
Lab. works	10%	
Course work	0%	
Quiz	10%	
Midterm Exam	20%	Written Exam
Final Exam	50%	Written Exam
Total	100%	

Assessment Criteria

Final grades are determined according to the Academic Regulations of Azerbaijan State Oil and İndustry University for undergraduate studies

Course Policies

1. Attendance of the course is mandatory.
2. Material presented in the lecture as well as assigned readings will be included in testing.
3. Late assignments will not be accepted unless an agreement is reached with the lecturer.
4. Cheating and plagiarism will not be tolerated.
5. Cheating will be penalized according to the Azerbaijan State Oil and Industrial University General Student Discipline Regulations

ECTS allocated based on Student Workload

Activities	Number	Duration (hour)	Total Workload (hour)
Course duration in class (including midterm)	15	5	75
Presentation	1	10	10
Self-study	15	4	60
Tutorials	15	4	60
Midterm Examination	1	3	3
Preparation for midterm exam	1	10	10
Final Examination	1	3	3
Preparation for final exam	1	20	20
Total Workload			241
Total Workload/30(h)			8.03
ECTS Credit of the Course			8

№	Laboratory works names	Number of hours
	Introduction to labs	2
1	Determination of moment of inertia by the method of falling	4
2	Determination of viscosity of liquids by Stokes's method	4
3	Determination of the resistivity by Ohm's law	4
4	Determination of the Stefan-Boltzmann constant.	2