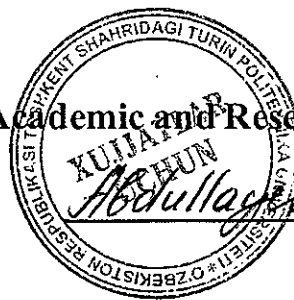


TURIN POLYTECHNIC UNIVERSITY IN TASHKENT

Approved by
Chief of the Academic and Research Department



EDUCATIONAL PROGRAM

Academic year 2020-2021

Physics

For preparatory year students

5140200 – Physics and Astronomy
5440100 - Physics



Physics

(Subject curriculum)

Lecture classes contest

GENERAL REQUIREMENTS ON THE SUBJECT

This plan was developed based on "Educational Program on Physics" approved by the Academic Department, the goals of the first year education on physics and student's knowledge on school physics and mathematics. The course content also is adapted to the student's knowledge of English. The course consists of 2 parts. The first part deals with basic concepts of mechanics, definitions of physical quantities, law's of motion and equations for translational and rotational motion and rigid body, hydrostatics. The second part gives knowledge of temperature concept, heat nature, connection between mechanics laws and macroscopic characteristics of ideal gases, relation between work and heat, thermodynamic principles, efficiency of heat engine.

Lecture classes contest

No	Lecture topics	Quantity of hours
1	Part 1. Mechanics. Introduction and measurements. Historical background. The fundamental quantities. The standards of length, mass, time and charge. Conversion factors.	2
2	Vectors. The displacement. The addition of vectors. Vector subtraction. Resolution of a vector into its components. Scalar or dot product of vectors. Vector or cross product of vectors.	2
3	Kinematics. Motion at a constant velocity, constant acceleration. Kinematic equations in one dimension and vector forms. Freely falling body. Projectile motion in two dimensions. Relative motion	4
4	Newton's laws of motion. Newton's laws. Applications of Newton's second law. Friction. Application of Newton's laws taking friction into account.	4
5	Equilibrium. The first condition of equilibrium. The concept of torque. The second condition of equilibrium. Center of gravity, center of mass. The crane boom and the ladder	4
6	Uniform circular motion. Gravitation. Centripetal acceleration. The centripetal and centrifugal forces. Newton's law of universal gravitation.	2
7	Energy and its conservation. Energy. Work. Power. Kinetic energy and gravitational potential energy. Energy conservation law.	4
8	Momentum and its conservation. Elastic and inelastic collisions. Collisions in one-dimension. Collisions in two dimensions	4
9	Rotational motion. Rotational kinematics. The kinematic energy of rotation. The moment of inertia. Newton's laws for rotational motion. Angular momentum and its conservation	4
10	Part II. Vibratory motion and fluids. Elasticity. The atomic nature of elasticity. Hook's law – stress and strain. Hook's law for a spring. Elasticity of shape – shear. Elasticity of volume	2

11	Simple harmonic motion. Periodic motion. The reference circle. The potential energy of a spring. Conservation of energy and the vibrating spring. The simple pendulum. Springs in parallel and in series	2
13	Fluids. Density. Pressure. Pascal's principle. Archimedes' principle. The equation of continuity. Bernoulli's theorem.	4
14	Part III. Thermodynamics. Temperature and heat. Temperature. Heat. Specific heat. Calorimetry. Change of phase	2
15	Thermal expansion and the gas laws. Linear expansion of solids. Area expansion of solids. Volume expansion of solids, liquids and gases. Charles' law. Gay-Lussac's law. Boyle's law. The ideal gas law. The kinetic theory.	4
16	Heat transfer. Convection. Conduction. Radiation	2
17	Thermodynamics. The concept of work applied to a thermodynamic system. Heat added to or removed from a thermodynamic system. The first law of thermodynamics. Some special cases of the first law of thermodynamics. The gasoline engine. the ideal heat engine. The Carnot cycle. The second law of thermodynamics. Entropy.	4
	TOTAL	50

Contents of practice studies

No	Physics problems of practice classes	Quantity of hours
1	Kinematics. Introduction to the metric system. Vector. Vector components.	2
2	One-dimensional motion. Motion at a constant velocity, constant acceleration.	2
3	Two-dimensional motion. Projectile motion, motion of the objects with initial velocity. Relative motion	2
4	Dynamics. Reason for change of motion velocity. Mass and inertia. Force and momentum. Force - the rate of momentum change. Newton's laws. Applications of Newton's second law to mechanical problems solution. Friction. Kinetic and static friction coefficients.	2
5	Equilibrium. Torque and two conditions equilibrium. The center of gravity and the center of mass. The crane boom and the ladder	2
6	Uniform Circular motion. Applications of dynamics law for circular motion and space flight. Gravitation.	2
7	Work, kinetic energy, potential energy. Work and transfer of mechanical energy. Energy conservation law. Kinetic and potential energy transformation. Power.	2
8	Elastic and inelastic collisions. Perfectly elastic and perfectly inelastic collisions. Collisions in one and two dimensions. Momentum transfer.	2
9	Measurement of rotational motion	2
10	Inertia moment of a body. Angular momentum. Torque – the rate of angular momentum change. Conservation of angular momentum.	2
11	Combined translational and rotational motion treated by the law of conservation of energy.	2
12	Elasticity. Simple harmonic motion. Conservation of energy and the vibrating spring	2
13	Fluids mechanics. Fluids. Buoyant force. Magnitude of buoyant force. Archimedes' principle. Pascal's principle. Hydraulic lift. Pressure dependence on depth.	2
14	Heat and temperature. Specific heat capacity. Calorimetry. Thermal expansion and gas laws. Heat transfer. Convection. Conduction	2

15	Work in thermodynamic system. Heat added to or removed from a thermodynamic system. Internal energy and The first law of thermodynamics. Adiabatic process.. Heat engines. Efficiency of heat engines. The Carnot engine	2
	Total	30
Tutorial		
1	Kinematics. . Introduction to the metric system. Vector. Vector components.	2
2	One-dimensional motion. Motion at a constant velocity, constant acceleration.	2
3	Two-dimensional motion. Projectile motion, motion of the objects with initial velocity. Relative motion	2
4	Dynamics. Reason for change of motion velocity. Mass and inertia. Force and momentum. Force - the rate of momentum change. Newton's laws. Applications of Newton's second law to mechanical problems solution. Friction. Kinetic and static friction coefficients.	2
5	Equilibrium. Torque and two conditions equilibrium. The center of gravity and the center of mass. The crane boom and the ladder	2
6	Uniform Circular motion. Gravitation. Applications of dynamics law to circular motion and space flight.	2
7	Work, kinetic energy, potential energy. Work and transfer of mechanical energy. Energy conservation law. Kinetic and potential energy transformation. Power.	2
8	Elastic and inelastic collisions. Perfectly elastic and perfectly inelastic collisions. Collisions in one and two dimensions. Momentum transfer.	2
9	Measurement of rotational motion	2
10	Inertia moment of a body. Angular momentum. Torque – the rate of angular momentum change. Conservation of angular momentum.	2
11	Combined translational and rotational motion treated by the law of conservation of energy.	2
12	Elasticity. Simple harmonic motion. Conservation of energy and the vibrating spring	2
13	Fluids mechanics. Fluids. Buoyant force. Magnitude of buoyant force. Archimed's principle. Pascal's principle. Hydraulic lift. Pressure dependence on depth.	2
14	Heat and temperature. Specific heat capacity. Calorimetry. Thermal expansion and gas laws. Heat transfer. Convection. Conduction	2
15	Work in thermodynamic system. Heat added to or removed from a thermodynamic system. Internal energy and The first law of thermodynamics. Adiabatic process.. Heat engines. Efficiency of heat engines. The Carnot engine	2
	Total	30

Contents of lab work

No	Subject of lab classes	Quantity of hours
1	Safety. Definition of errors. How to use measuring tools	2
2	Atwood machine/Measurement of acceleration due to gravity (g) by a compound pendulum	2
3	Moment of Inertia of a Flywheel/Moment of inertia of Oberbeck pendulum	2

4	Young's modulus/Measurement of viscosity of liquid	2
	Total	8

Literature:

1. Peter.J. Nolan. Fundamental of College physics. 2010
2. Halliday&Resnick. 9th- ed. Fundamentals of Physics. 2015
3. University Physics. Hugh D. Young, Roger A. Freedman. 2007
4. Paul G. Hewitt. Conceptual Physics. 1989.
5. Jay Orear. Physics. Macmillan Publishing Co. 1979.
6. Volkenstein. V. E. Problems book for Course of General Physics.
7. Physics manual Part I: Mechanics. A.Yarbekov, K.Tursunmetov, M. Makhkamov. 2020

Head of the
Department

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26.08.20