

**Syllabus of pre-study course on general physics**  
**-40 hours-**

1. (2h) The SI system of units, review of fundamental algebra, functions and graphs.  
Properties and applications of the exponential functions and logarithms.
2. (2h) Kinematics – speed, velocity and acceleration – description of uniform and uniform accelerated motion.
3. (2h) Dynamics – motion and force  
Newton's first law of motion – law of inertia:  
Mass and weight  
Newton's second law of motion; velocity and acceleration  
Newton's third law of motion.  
Force of friction.  
Forces on an object sliding down an incline.
4. (2h) Kinematics and Dynamics of Uniform Circular Motion  
Angular velocity and angular acceleration.  
Centripetal or radial acceleration, centripetal force.  
Frequency and period.  
Torque: lever action and balance.
5. (2h) Work, energy and power.  
Kinetic and potential energy.  
Conservative and non-conservative forces.  
Law of conservation of energy.
6. (2h) Temperature - the molecular interpretation of temperature.  
The zero-th law of thermodynamic.  
Gas laws.
7. (2h) Heat, energy transfer, internal energy, specific heat.  
The first law of thermodynamics.  
Latent heat and change of phase.
8. (2h) The second law of thermodynamics.  
Heat engines and efficiency.
9. (2h) Properties of liquids  
Pascal's principle.  
Buoyancy and Archimedes' principle.  
Surface tension and capillarity.  
Laplace's Law.
10. (2h) Bodies in equilibrium; elasticity and fracture.  
The study of forces in equilibrium, condition of equilibrium, elasticity.  
Hook's law, stress and strain, Young's modulus
11. (2h) Simple harmonic motion (SHM) and wave motion

Sinusoidal nature of SHM.  
Resonance and forced vibrations.  
Propagation of waves, sound waves.  
Destructive and constructive interference.

12. (2h) Electric charge and electric field.  
Coulomb's law, electric force, field lines, conductors.
13. (2h) Electric field.  
Electric potential, potential difference, relationship between electric potential and electric field, equipotential lines, work, potential energy, capacitance, capacitors, dielectrics, storage of electric energy.
14. (2h) Electric currents  
Ohm's law, resistivity, electric power, dc circuits: resistors in series and in parallel, Kirchhoff's rules, capacitors in series and in parallel.
15. (2h) Magnetism  
Magnets and magnetic fields.  
Magnetic field due to a straight wire, force between two parallel wires – electro-dynamic force.  
Force on electric charge moving in a magnetic field.
16. (2h) Electromagnetic induction  
Magnetic flux, induced electromotive force (EMF), Faraday's law  
Lenz's law, eddy currents.
17. (2h) Optics  
Reflection, refraction, index of refraction, dispersion.  
Snell's law, total internal reflection.  
Lenses; ray diagram, the lens equation, the lens maker's equation
18. (2h) Modern physics  
The Bohr model of the atom.  
Photon theory of light.  
Photoelectric effect, wave-particle duality, de Broglie wavelength.  
Atomic spectra.
19. (2h) Nuclear physics  
Structure and properties of the nucleus, binding energy, nuclear forces.  
Radioactivity: alpha, beta and gamma decay.
20. (2h) Rate of decay, half-life.  
Detection of radiation, measurements of radiation, activity, absorbed and effective dose.

**Suggested textbooks:**

1. "General Physics – a brief guide"  
L. Kubisz & M. Tuliszka  
Karol Marcinkowski Univ. of Med. Sciences in Poznan, 2002  
ISBN 83-88732-95-1
2. Columbia Review: High Yield Physics by Stephen Bresnick, M.D.  
Williams & Wilkins A Waverly Company 1996  
ISBN 0-683-18070-3
3. Physics. Principles with applications.  
Douglas C. Giancoli, Perentice Hall  
ISBN 0-13-672411-6