PHYSICS

SYLLABUS FOR HIGHER SECONDARY FIRST YEAR COURSE

Higher Secondary stage of school education is a stage of transition from general education to discipline - based focus on curriculum. The present updated syllabus keeps in view the rigour and depth of disciplinary approach as well as the comprehension level oflearners. Due care has also been taken that the syllabus is comparable to the international standards. Salient features ofthe syllabus include:

- Emphasis on basic conceptual understanding ofthe content.
- Emphasis on use of'Sl units, symbols, nomenclature of physical quantities and formulations as per international standards.
- Providing logical sequencing of units of the subject matter and proper placement of concepts with their linkage for better learning.
- Reducing the curriculum load by eliminating overlapping of concepts/content within the discipline and other disciplines.
- Promotion of process-skills, problem-solving abilities and applications of physics concept.

Besides, the syllabus also attempts to

- strengthen the concepts developed at the secondary stage to provide firm foundation for further learning in the subject.
- expose the learners to different processes used in Physics-related industrial and technological applications.
- develop process-skills and experimental, observational, manipulative, decision making and investigatory skills in the learners.
- promote problem solving abilities and creative thinking in learners.
- develop conceptual competence in the learners and make them realize appreciate the interface of physics with other disciplines.

One Paper (Theory)   **Time: 3 hours**   **Total Marks: 70**

Unit		No. of Periods	Marks.
Unit–I	**Physical World and Measurement**	10	
	Chapter-1: Physical World		
	Chapter–2: Units and Measurements		
Unit-II	**Kinematics**	24	20
	Chapter–3: Motion in a Straight Line		
	Chapter–4: Motion in a Plane		
Unit–III	**Laws of Motion**	16	
	Chapter–5: Laws of Motion		
Unit–IV	**Work, Energy and Power**	16	
	Chapter—6: Work, Energy and Power		

Unit	Title	Periods	Marks
Unit–V	**Motion of System of Particles and Rigid Body**	18	15
	Chapter–7: System of Particles and Rotational Motion		
Unit-VI	**Gravitation**	12	
	Chapter–8: Gravitation		
Unit–VII	**Properties of Bulk Matter**	24	23
	Chapter–9: Mechanical Properties of Solids		
	Chapter–10: Mechanical Properties of Fluids		
	Chapter–11: Thermal Properties of Matter		
Unit–VIII	**Thermodynamics**	12	
	Chapter–12: Thermodynamics		
Unit–IX	**Behaviour of Perfect Gases and KineticTheory of Gases**	10	
	Chapter–13: Kinetic Theory		
Unit–X	**Oscillations and Waves**	28	12
	Chapter–14: Oscillations		
	Chapter––15: Waves		
	Total	170	70

Unit I: Physical World and Measurement.   **10 Periods**
Chapter–1: Physical World

Physics-scope and excitement; nature of physical laws; Physics, technology and society. (To

be discussed as a part of introduction and integrated with other topics)

Chapter–2: Units and Measurements

Need for measurement: Units of measurement; systems of units; SI units, fundamental and

derived units. Length, mass and time measurements; accuracy and precision of measuring

instruments; errors in measurement; significant figures. Dimensions of physical quantities,

dimensional analysis and its applications.

Unit II: Kinematics   **24 Periods**
Chapter–3:   Motion in a Straight Line

Elementary concepts of differentiation and integration for describing motion, uniform and

non- uniform motion, average speed and instantaneous velocity, uniformly accelerated

motion, velocity - time and position-time graphs.

Relations for uniformly accelerated motion (graphical treatment).

Chapter–4:   Motion in a Plane

Scalar and vector quantities; position and displacement vectors, general vectors and their

notations; equality of vectors, multiplication of vectors by a real number; addition and

subtraction of vectors, relative velocity, Unit vector; resolution of a vector in a plane, rectangular components, Scalar and Vector product of vectors.

Motion in a plane, cases of uniform velocity and uniform acceleration- projectile motion, uniform circular motion.

Unit III: Laws of Motion   16 Periods
Chapter–5: Laws of Motion

Intuitive concept of force, Inertia, Newton's first law of motion; momentum and Newton's second law of motion; impulse; Newton's third law of motion.

Law of conservation of linear momentum and its applications.
Equilibrium of concurrent forces, Static and kinetic friction, laws of friction, rolling friction, lubrication.
Dynamics of uniform circular motion: Centripetal force, examples of circular motion (vehicle on a level circular road, vehicle on a banked road).

Unit IV: Work, Energy and Power   16 Periods
Chapter–6: Work, Energy and Power

Work done by a constant force and a variable force; kinetic energy, work- energy theorem, power. Notion of potential energy, potential energy of a spring, conservative forces: conservation of mechanical energy (kinetic and potential energies); non-conservative forces: motion in a vertical circle; elastic and inelastic collisions in one and two dimensions.

Unit V: Motion of System of Particles and Rigid Body.   18 Periods
Chapter–7: System of Particles and Rotational Motion

Centre of mass of a two-particle system, momentum conservation and centre of mass motion.

Centre of mass of a rigid body; centre of mass of a uniform rod.

Moment of a force, torque, angular momentum, law of conservation of angular momentum and its applications.

Equilibrium of rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions.

Moment of inertia, radius of gyration, values of moments of inertia for simple geometrical objects (no derivation).

Unit VI: Gravitation   12 Periods
Chapter–8: Gravitation

Universal law of gravitation. Acceleration due to gravity (recapitulation only) and its variation with altitude and depth. Gravitational potential energy and gravitational potential, escape velocity, orbital velocity of a satellite, Geo-stationary satellites, Weight losses.

Unit VII: Properties of Bulk Matter.   **24 Periods**
Chapter–9: Mechanical Properties of Solids

Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear modulus.

Chapter–10: Mechanical Properties of Fluids

Pressure due to a fluid column; Pascal's law and its applications (hydraulic lift and hydraulic brakes), effect of gravity on fluid pressure.

Viscosity, Stokes' law, terminal velocity, streamline and turbulent flow, critical velocity, Bernoulli's theorem and its applications.

Surface energy and surface tension, angle of contact, excess of pressure across a curved surface, application of surface tension ideas to drops, bubbles and capillary rise.

Chapter–11: Thermal Properties of Matter

Heat, temperature, thermal expansion; thermal expansion of solids, liquidsand gases, anomalous expansion of water; specific heat capacity; Cp, Cv - calorimetry; change of state - latent heat capacity. Heat transfer-conduction, convection and radiation, thermal conductivity.

Unit VIII: Thermodynamics   **12 Periods**
Chapter–12: Thermodynamics

Thermal equilibrium and definition of temperature (zeroth law of thermodynamics), heat, work and internal energy. First law of thermodynamics, isothermal and adiabatic processes.

Second law of thermodynamics: reversible and irreversible processes.

Unit IX: Behaviour of Perfect Gases and Kinetic Theory of Gases.   **10 Periods**
Chapter–13: Kinetic Theory

Equation of state of a perfect gas, work done in compressing a gas.

Kinetic theory of gases - assumptions, concept of pressure. Kinetic interpretation of temperature; rms speed of gas molecules; degrees of freedom, law of equi-partition of energy (statement only) and application to specific heat capacities of gases; concept of mean free path, Avogadro's number.

Unit X: Oscillations and Waves   **28 Periods**
Chapter–14: Oscillations

Periodic motion - time period, frequency, displacement as a function of time, periodic functions.

Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a loaded spring-restoring force and force constant; energy in S.H.M. Kinetic and potential energies; simple pendulum derivation of expression for its time period. Free, forced and damped oscillations (qualitative ideas only), resonance.

Chapter–15: Waves

Wave motion: Transverse and longitudinal waves, speed of travelling wave, displacement relation for a progressive wave, principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, Beats, Doppler effect.

PRACTICALS   Total Period : 60

The record, to be submitted by the students, at the time of their annual examination, has to include:

- Record of at least 15 Experiments [with a minimum of 6 from each section], to be performed by the students.
- Record of at least 5 Activities [with a minimum of 2 each from section A and section B], to be demonstrated by the teachers.
- Report of the project to be carried out by the students.

EVALUATION SCHEME

Time Allowed: Three hours   Max. Marks: 30

Two experiments one from each section	8+8 Marks
Practical record (experiment and activities)	6 Marks
Investigatory Project	3 Marks
Viva on experiments, activities and project	5 Marks
Total	**30 Marks**

SYLLABUS FOR PHYSICS PRACTICAL
Total Marks-30
Section-A

Experiments:

1. Use of Vernier Callipers

(i) To measure diameter of a small spherical/cylindrical body.

(ii) To measure dimensions of a given regular body of known mass and hence fmd its density.

(iii) To measure internal diameter and depth of a given beaker/calorimeter and hence finds

its volume.

2. Use of screw gauge.
   (i) To measure diameter of a given wire.
   (ii) To measure thickness of a given sheet. (iii) To measure volume of an irreguler lamina.
3. To determine radius of curvature of a given spherical surface by a spherometer.
4. To determine the mass of two different objects using a beam balance.
5. To find the weight of a given body using parallelogram law of vectors.
6. Using a simple pendulum, plot L- T and L-T^2 graphs. Hence find the effective length of a second's pendulum using appropriate graphs.
7. To study the relationship between force of limiting friction and normal reaction and find the coefficient of friction between a block and a horizontal surface.
8. To find the downward force, along an inclined plane, acting on a roller due to gravitational pull of the earth and study its relationship with the angle of inclination by plotting graph between force and sin of angle of inclination .

Activities :

1. To make a paper scale of given least count, e.g. O.2cm. O.5cm.
2. To determine mass of a given body using a meter scale by principle of moments.
3. To plot of graph for a given set of data, with proper choice of scales and error bars.
4. To measure the force of limiting friction for rolling of a roller on a horizontal plane.
5. To study the variation in the range of a jet of water with the angle of projection.
6. To study the conservation of energy of a ball rolling down on inclined plane (using a double inclined plane).
7. To study dissipation of energy of a simple pendulum by plotting a graph between square of amplitude and time.

Section-B

Experiments :

1. To determine young's modulus of elasticity of the material of a given wire.
2. To find the force constant and effective mass of a helical spring by plotting T2-m graph method of oscillation.
3. To study the variation in volume with pressure for a sample of air at constant temperature by plotting graphs between P and V, and between P and 1IV.
4. To determine the surface tension of water by capillary rise method.
5. To determine the coefficient of viscosity of a given viscous liquid by measuring the terminal velocity of a given spherical body.
6. To study the relationship between the temperature of a hot body and time by plotting a cooling curve.
7. (i)To study the relation between frequency and length of a given wire under constant tension using sonometer.
   (ii)To study the relation between the length of a given wire tension for constant frequency using sonometer
8. To find the speed of sound in air at room temperature using a resonance tube by two resonance position.
9. To determine specific heat capacity of a given (i) solid (ii) liquid, by method of mixtures.

Activities :

1. To observe change of state and plot a cooling curve for molten wax.
2. To observe and explain the effect of heating on a bi-metallic strip.
3. To note the change in level of liquid in a container on heating and interpret the observation.
4. To study the effect of detergent on surface tension of water by observing capillary rise.
5. To study the factors affecting the rate of loss of heat of a liquid.
6. To study the effect of load on depression of a suitably clamped meter scale loaded
   (i) at its end
   (ii) in the middle.

Prescribed Textbook:

(English Medium)
1. Physics Part-I, Textbook for Class XI, Published by NCERT.
2. Physics Part-II, Textbook for Class XI, Published by NCERT.
3. Laboratory Manual of Physics, Class XI, Published by NCERT.

(Assamese Medium)
1. Padartha Bigyan, Pratham Bhag, Published by AHSEC
2. Padartha Bigyan, Dwitiya Bhag, Published by AHSEC