NBSE Class 11 Physics Syllabus

PHYSICS

OBJECTIVES:

Emphasis on the basic conceptual understanding of the content.

- Emphasis on use of SI 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 concepts.
- 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 and appreciate the interface of Physics with other disciplines.

DESIGN OF QUESTION PAPER
PHYSICS

Weightage to different forms of questions:

Sl. no.	Forms of Questions	Marks for each question	No. of questions	Total marks
1.	MCQ	1	5	5
2.	VSA	1	5	5
3.	SA- I	2	6	12
4.	SA- II	3	11	33
5	LA	5	3	15
	Total		**30**	**70**

Weightage level of questions:

Sl.no.	Level	Percentage	Marks
1.	Easy	15	11
2.	Average	70	49
3.	Difficult	15	10

The expected time to be taken under different forms of questions shall be as follows:

Sl.no.	Forms of questions	Expected time for each question	Total expected time
1.	MCQ	-	3 minutes
2.	VSA	1 minute	5 minutes
3.	SA- I	4 minutes	24 minutes
4.	SA- II	8 minutes	88 minutes
5.	LA	15 minutes	45 minutes
6.	Reading Q.paper & Revision	15 minutes	15 minutes

		Total time	180 minutes

Scheme of Options :
1. There will be no overall options.
2. Internal choice (parallel question) shall be provided in :
    i. any 3(three) questions in 2 marks
    ii. any 4(four) questions in 3 marks
    iii. 3(three) questions in 5 marks
3. Weightage of about 10 marks shall be given for numerical problems.

CLASS - XI
PHYSICS (Theory)

Unit-wise weightage

Theory Paper	Time: 3 Hrs.	Marks: 70

Unit		Marks
I.	Physical World & Measurement	04
II.	Kinematics	10
III.	Laws of Motion	08
IV.	Work, Energy & Power	06
V.	Motion of System of Particles & Rigid Body	06
VI.	Gravitation	06
VII.	Properties of Bulk Matter	10
VIII.	Thermodynamics	05
IX.	Behaviour of Perfect Gas & Kinetic Theory of Gases	05
X.	Oscillations & Waves	10
	Total	**70**

Part – A: External

Unit-I: Physical World and Measurement   4 marks/10 periods

Physics : scope and excitement; nature of physical laws; Physics, technology and society.
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   10 marks/30 periods

Frame of reference, Motion in a straight line: Position-time graph, speed and velocity. 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).

Elementary concepts of differentiation and integration for describing motion. *Scalar and vector quantities*: Position and displacement vectors, general vectors and notation, 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 products of Vectors. Motion in a plane. Cases of uniform velocity and uniform acceleration-projectile motion. Uniform circular motion.

Unit III: Laws of Motion   8 marks/16 periods

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 level circular road, vehicle on banked road).

Unit IV : Work, Energy and Power   **6 marks/16 periods**

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   **6 marks/18 periods**

Centre of mass of a two-particle system, momentum conservation and center of mass motion. Centre of mass of rigid body; Centre of mass of uniform rod.

Moment of a force, torque, angular momentum, conservation of angular momentum with some examples.

Equilibriumof rigid bodies, rigid body rotation and equations of rotational motion, comparison of linear and rotational motions; moment of inertia, radius of gyration. Values of M.I. for simple geometrical objects (no derivation). Statement of parallel and perpendicular axes theorems and their applications.

Unit VI: Gravitation   **6 marks/14 periods**

Kepler's laws of planetary motion. The universal law of gravitation. Acceleration due to gravity and its variation with altitude and depth.

Gravitational potential energy; gravitational potential. Escape velocity, Orbital velocity of a satellite. Geo-stationary satellites.

Unit VII: Properties of Bulk Matter   **10 marks/28 periods**

Elastic behaviour, Stress-strain relationship, Hooke's law, Young's modulus, bulk modulus, shear, modulus of rigidity. Posson's ratio; elastic energy.

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, Reynold's number, streamline and turbulent flow. Critical velocity, Bernoulli's theorem and its applications.

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

Heat, temperature, thermal expansion; thermal expansion of solids, liquids, and gases. Anomalous expansion. Specific heat capacity: C_P, C_V - calorimetry; change of state – latent heat.

Heat transfer-conduction and thermal conductivity, convection and radiation, Qualitative ideas of Black body Radiation, Wein's displacement law and Green House Effect.

Newton's law of cooling and Stefan's Law.

Unit VIII: Thermodynamics   **5 marks/12 periods**

Thermal equilibrium   and definition of temperature (zeroth law of thermodynamics). Heat, work and internal energy. First law of thermodynamics. Isothermal and adiabatic process.

Second law of thermodynamics: reversible and irreversible processes. Heat engines and refrigerators.

Unit IX: Behaviour of Perfect Gas and Kinetic Theory   5 marks/8 periods
Equation of state of a perfect gas, work done on compressing a gas.

Kinetic theory of gases : Assumptions, concept of pressure. Kinetic energy and temperature; rms speed of gas molecules; degrees of freedom, law of equipartition of energy (statement only) and application of specific heat capacities of gases; concept of mean free path, Avogadro's number.

Unit X: Oscillations and Waves   10 marks/28 periods
Periodic motion – period, frequency, displacement as a function of time. Periodic functions. Simple harmonic motion (S.H.M) and its equation; phase; oscillations of a 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.

Wave motion. Longitudinal and transverse waves, speed of wave motion. Displacement relation for a progressive wave. Principle of superposition of waves, reflection of waves, standing waves in strings and organ pipes, fundamental mode and harmonics, Beats, Doppler effect.

Part – B: Internal (Practical)
Section A
Experiments
 1.   To measure diameter of a small spherical/cylindrical body using Vernier calipers.
 2.   to measure internal diameter and depth of a given beaker/calorimeter using Vernier calipers and hence find its volume.
 3.   To measure diameter of a given wire, using screw gauge.
 4.   To measure thickness of a given sheet using screw gauge.
 5.   To measure volume of an irregular lamina using screw gauge.
 6.   To determine radius of curvature of a given spherical surface by a spherometer.
 7.   To determine the mass of two different objects using a beam balance.
 8.   To find the weight of a given body using parallelogram law of vectors.
 9.   Using a simple pendulum, plot L-T and L-T^2 graphs. Hence find the effective length of second's pendulum using appropriate graph.
10.   To study the relationship between force of limiting friction and normal reaction and to find co-efficient of friction between a block and a horizontal surface.
11.   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 (θ) by plotting graph between force and $\sin\theta$.

Activities
 1.   To make a paper scale of given least count, e.g. 0.2cm, 0.5cm.

2.	To determine mass of a given body using a metre scale by principle of moments.
3.	To plot a 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 range of a jet of water with 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 of a helical spring by plotting graph between load and extension.
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 I/V.
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 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.	To determine specific heat capacity of a given (i) solid (ii) liquid, by method of mixtures.
8.	(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 and tension for constant frequency using sonometer.
9.	To find the speed of sound in air at room temperature using a resonance tube by two-resonance positions.

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 observations.
4.	To study the effect of detergent on surface tension 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 metre scale loaded (i) at its end (ii) in the middle.

Evaluation Scheme for Practical Examination:

1. One experiment from each section.		6+6=12 marks
2. One activity from any section.		4 marks
3. Practical record (experiments & activities).		6 marks
4. Record of demonstration experiments & viva based on these experiment.		3 marks
5. Viva on experiment & activities.		5 marks
	Total	**30 marks**

1. Prescribed textbook:
Physics Class XI		-	*NCERT Textbook (Nagaland Edition)*
				Printed & distributed by Goyal Brothers Prakashan
2. Reference book:
Modern abc of Physics	-	*Modern Publishers*
by Satish K. Gupta		*MBD House, Railway Road*
				Jalandhar City
*3.	Laboratory Manual Book:*