DR.C.V.RAMAN SCIENCE COLLEGE, SIRONCHA

Department Of Physics

FACULTY OF SCIENCE

Syllabus of

B.Sc. First Year (Semester pattern) (Choice Based Credit System)

SUBJECT - PHYSICS

Semester I & Semester II

Semester I & Semester II

SUBJECT - PHYSICS

Teaching and Semester Examination Scheme for B.Sc(First Year) .

Class	Semester	Course	Teaching Scheme Per Week (workload)			Examination Scheme			
				Total		Theory Marks		Practical Marks	Total Marks
						Paper	Internal Assessment		
B. Sc. I	I	USPHT 01	3	6 + 1T	6	50	10	30	150
		USPHT 02	3			50	10		
	II	USPHT 03	3	6 + 1T	6	50	10	30	150
		USPHT 04	3			50	10		

B.Sc.Semester CBCS Pattern Examination Scheme

1. There shall be total six semesters.
2. Each semester shall comprise of 90 teaching days.
3. Each Semester I to VI shall be of 150 marks.
4. Distribution of marks will be as follows

i.	Paper I Theory	---- 50 marks
	Internal Assessment	---- 10 marks
ii.	Paper II Theory	---- 50 marks
	Internal Assessment	---- 10 marks
iii.	Practical	---- 30 marks
Total	(i+ii+iii)	---- 150 marks

5. The marks on internal assessment of the student shall be compounded with the theory Paper. The passing marks will be **35%** marks .

6. A student will have to perform at least Ten (**10**) experiments per semester. At the time of Practical examination every student has to perform two experiment, each of three hours duration.

7. The distribution of marks for practical examination is as follows.

Record Book	----	6
Viva-voce	----	6
Experiment	----	18
TOTAL	**----**	**30**

8. Evaluation of the student during the semester for internal assessment:-

i) For Theory internal

S.N.	Work Assigned	Marks	Marks Obtained
1	Assignment	**02**	
2	Class Test	**05**	
3	Active Participation/Seminar/Routine Activity etc.	**03**	

Signature of teacher in-charge Head of Department

9. The internal assessment shall be done by respective college and the marks shall be sent to the university one month prior to the final examination of each semester.

10. All theory papers shall be divided into four units. Each unit shall be cover in 15 periods of 48 minutes.

11. The theory question paper shall be of 3 hours duration and comprise of 5 questions with internal choice and with equal weightage to all units. The pattern of question paper shall be as follows.

Pattern of Question Paper

Subject – Physics

Time: 3 Hours **Maximum marks :50**

Question No.			**Marks Allotted**
Qu. 1			
Either			
	From Unit - I		10
	OR		
	From Unit - I		10
Qu. 2			
Either			
	From Unit - II		10
	OR		
	From Unit - II		10
Qu. 3			
Either			
	From Unit – III		10
	OR		
	From Unit - III		10
Qu. 4			
Either			
	From Unit - IV		10
	OR		
	From Unit - IV		10
Qu. 5 Attempt any 10 questions from the following.			
	(a)	Unit - I	1
	(b)	Unit - I	1
	(c)	Unit - I	1
	(d)	Unit – II	1
	(e)	Unit – II	1
	(f)	Unit – II	1
	(g)	Unit – III	1
	(h)	Unit – III	1
	(i)	Unit – III	1
	(j)	Unit – IV	1
	(k)	Unit – IV	1
	(l)	Unit – IV	1

The above pattern is for all two papers of each semester of B.Sc. I w.e.f. **2017-18** & B.Sc. II and B.Sc. III from next subsequent years.

Proposed Syllabus for B.Sc. I CBCS (Semester Pattern)Subject – Physics

The syllabus of Physics as per semester system for the B.Sc. I will be implemented from the Academic year **2017-2018**.

Name of Programme	Duration	Semester	Subject :- Physics	Code	Title
B.Sc. I	Two semesters	I	Theory	USPHT01	Mechanics and Relativity
				USPHT02	Gravitation, Oscillation and Properties of Matter
			Practical	USPHP01	10 experiments
		II	Theory	USPHT03	Vector Analysis and Electrostatics
				USPHT04	Magnetostatics and Electromagnetic Waves
			Practical	USPHP02	10 experiments

USPHT01: MECHANICS AND RELATIVITY

Aim: To make the students understand the basic concepts of Mechanics and Relativity as core part of the subject.

Unit I:

Laws of Motion: Newton's laws of motion and its limitations, Components of velocity and Acceleration (radial and transverse), Frame of reference, inertial and non-inertial frame of reference, uniformly rotating frame, Centripetal force,

Centre of Mass: Centre of mass**,** Linear momentum about centre of mass, equation of motion of centre of mass.
Numericals.

Unit II:

Momentum and Energy: Conservation of momentum. Work and energy. Conservation of energy. Motion of rockets.(Single stage and multistage)

Collision: Perfectly elastic and inelastic collision in one dimension, velocities of particles in elastic collision, application of elastic collision,
Numericals

Unit III:

Dynamics of rigid body: Moment of inertia, radius of gyration, physical significance of Moment of inertia, Principle of perpendicular and parallel axis (no derivations), Moment of inertia of a ring, rod, solid sphere and rectangular lamina.
Numericals.

Rotational Motion: Angular velocity and angular momentum. Torque. Conservation of angular momentum. Isotropy and rotation invariance of space, angular impulse, homogeneity and isotropy of time. Conservation of energy (from homogeneity of time and Newton's laws of motion)
Numericals.

Unit IV:

Special Theory of Relativity: Constancy of speed of light. Postulates of Special Theory of Relativity. Length contraction. Time dilation, variation of mass with velocity. Relativistic addition of velocities. Mass energy equivalence.
Numericals.

USPHT02: Gravitation, Oscillation and Properties of Matter

Aim : Students should understand the concept related with Gravitation and Properties of Matter.

Unit I:

Gravitation: Newton's Law of Gravitation. Motion of a particle in a central force field (motion is in a plane, angular momentum is conserved, areal velocity is constant), Gravitational Field and Gravitational potential. Gravitational potential due to spherical shell.

Gravitation: Gravitational self-Energy of a body, Kepler's Laws (statement only). Satellite in circular orbit and applications. Geosynchronous orbits. Weightlessness. Basic idea of global positioning system (GPS).

Numericals.

Unit II:

Oscillations: Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages.

Free, Damped and Forced harmonic Oscillations, Differential equation of a damped oscillator and its solutions, Energy equation of damped oscillations, Power dissipation, Power absorption, Resonance, Quality factor and band width.

Numericals.

Unit III:

Elasticity: Hooke's law , Stress-strain diagram , Elastic moduli-Relation between elastic constants Poisson's Ratio, Expression for Poisson's ratio in terms of elastic constants, Work done in stretching and in twisting a wire. Twisting couple on a cylinder, Determination of Rigidity modulus by static torsion , Torsional pendulum, Determination of Rigidity modulus. Numericals.

Unit IV:

Viscosity: Streamline and Turbulent flow, Coefficient of viscosity, Reynold's number, equation of continuity, Bernoulli's theorem and its applications (Lift of an Aeroplane and Atomizer), Poiseulle's equation.

Surface tension: Surface tension and its molecular interpretation, Angle of contact, Excess of pressure inside a liquid drop, bubble in air and liquid, wetting and spreading,

Numericals.

USPHP01 : (Practical)

Every student will have to perform at least five (05) experiments from each group. This odd semester practical examination shall be conducted by **Internal Examiner.**

Group A

1. To determine height of building using Sexant.
2. Moment of inertia of flywheel.
3. Study of conservation of momenta in two dimensional collisions.
4. Study of compound pendulum.
5. To determine '**g**' by Kater's Pendulum.
6. To study the Motion of a Spring and calculate (a) Spring Constant (b) Value of g
7. Study of oscillations of mass under different combinations of spring.
8. To determine '**g'** and velocity for a freely falling body using Digital Timing Technique.
9. Calculation of percentage error of diameter of orifice of capillary.

Group B

1. Young's modulus by Cantilever.
2. Modulus of rigidity by statistical method.
3. Coefficient of viscosity by Poiseulle's flow method.
4. Determination of surface tension by Quinke's method.
5. Determination of surface tension by capillary rise method.
6. Modulus of rigidity by Tortional Pendulum.
7. Young's modulus by bending of beam.
8. Young's modulus by Vibration method.
9. To determine the Modulus of Rigidity of a Wire by Maxwell's needle.

Reference Books: Semester I

1. Fundamentals of Physics – Halliday and Resnick (6^{th} edition)
2. Concepts of Physics Vol. I and II - H.C. Verma
3. Properties of Matter – Brijlal
4. Waves and Oscillations – Chaudhari R.N.
5. Berkely Physics Course – Vol. I
6. Physics for degree students B.Sc. First Year – C.L. Arora, Dr P.S. Hemne
7. Mechanics – D.S. Mathur , Dr. P.S. Hemne
8. B.Sc. Practical Physics – Dr. P.S. Hemne, Harnam Singh
9. University Physics- FW Sears, MW Zemansky and HD Young
10. Engineering Mechanics- Basudeb Bhattacharya
11. University Physics- Ronald Lane Reese

USPHT03 : Vector Analysis and Electrostatics

Aim : To make the students understand the basic concepts vectors and vector analysis and its applications in electostatics as core part of the subject.

Unit I: Vector Analysis:

Scalar and Vector, Scalar and Vector product, gradient, divergence, Curl and their significance, Vector Integration, Line, surface and volume integrals of Vector fields, Gauss-divergence theorem and Stoke's theorem of vectors (statement only). Numericals.

Unit II: Electrostatics- I

Definitions of electric field, electric field intensity, electric potential, electric dipole, electric dipole moment, electric quadrupole. Electric field intensity due to electric dipole, quadrupole, electric field as a negative gradient of potential, conservative nature of electric field, torque on a dipole in a uniform electric field. Potential energy of an electric dipole, electrostatics field energy. Flux of electric field.
Numericals

Unit III: Electrostatics- II

Gauss's theorem of electrostatics(no derivation), applications of Gauss theorem- Electric field due to point charge, infinite line of charge, uniformly charged spherical shell and solid sphere, plane charged sheet, charged conductor.
Electric potential due to a point charge, electric dipole (along axial line and equatorial line), uniformly charged spherical shell and solid sphere. Numericals,

Unit IV: Electric field in dielectric:

Capacitance of an isolated spherical conductor. Parallel plate, spherical and cylindrical condenser. Energy per unit volume in electrostatic field. Dielectric medium, Polarisation, Displacement vector. Parallel plate capacitor completely filled with dielectric. Numericals.

USPHT04: Magnetostatics and Electromagnetic Waves

Aim : To make the students understand the basic concepts of Magnetostatics and Elecrtomagnetic Waves as core part of the subject.

Unit I: Magnetostatics

Biot-Savart's law & its applications- straight conductor, circular coil, solenoid carrying current. Divergence and curl of magnetic field. Magnetic vector potential. Ampere's circuital law. **Magnetic properties of materials:** Magnetic intensity, magnetic induction, permeability, magnetic susceptibility. Brief introduction of diamagnetic, paramagnetic, and ferromagnetic materials. Numericals.

Unit II: Electromagnetic Induction:

Faraday's laws of electromagnetic induction, Lenz's law, self(L) and mutual inductance(M), L of single coil, M of two coils. Energy stored in magnetic field. **Transformer** – Construction and working, Energy losses, parameters and application . Numericals

Unit III: Maxwell`s equations and Electromagnetic Wave Propagation:

Equation of continuity of current, Displacement current, Maxwell's equations, Poynting vector and Poynting theorem, energy density in electromagnetic field, electromagnetic wave propagation through vacuum and isotropic dielectric medium, transverse nature of EM waves.
Numericals

Unit IV: Steady Electric current:

Kirchoff's laws and its applications, Rise and decay of current in LR, CR circuits, time Constants, Decay of charge in LCR circuits.

Alternating electric current: AC circuits, Complex numbers, j-operator and applications to LR and CR circuits.
Numericals

USPHP02 :(Practical)

Every student will have to perform at least five (05) experiments from each group. This even semester practical examination shall be conducted by**Internal and External Examiners** both.

Group A

1. Use of vibration magnetometers to study a field.
2. To compare capacitance using De'Sauty's bridge .
3. Measurement of inductance using impedance at different frequencies.
4. Measurement of capacitance using impedance at different frequencies.
5. Study of decay of currents in LR circuits.
6. Response curve of LCR circuit, resonance frequency and quality factor.
7. Study of Transformer.
8. Characteristic of Choke.
9. Determination of high resistance by Leakage method.

Group B

1. To determine a Low Resistance by Carey -Foster's Bridge.
2. To verify the Thevenin's theorem.
3. To verify the Norton'sTheorem.
4. To verify the Superposition electrical network.
5. To verify the Maximum Power Transfer Theorem.
6. To verify the Milliman's Theorem.
7. Calibration of ammeter by Potentiometer.
8. Determination of resistance of Galvanometer by half deflection method.
9. Low resistance by Potentiometer.

Reference Books: Semester II

1. Electricity and Magnetism -- Edward M. Purcell
2. Electricity and Magnetism -- J.H. Fewkes & J. Yarwood
3. B.Sc. Practical Physics -- Dr P.S. Hemne, Harnam Singh
4. Electricity and Magnetism--D C Tayal
5. Physics for degree students B.Sc. First Year – C.L. Arora, Dr P.S. Hemne
6. Electromagnetic waves and radiating systems – E.C. Jordan
7. Electricity and Magnetism – S.S. Atwood
8. Electricity and Magnetism – A.S. Mahajan and A.A. Rangwala
9. Electricity and Magnetism - Brijlal and Subramanyam
10. Electricity and Magnetism – D.N. Wasudeva
11. Electrodynamics – S.L. Gupta and R. Singh
12. Mechanics and Electrodynamics – Brijlal and Subramanyam
13. Introduction to electrodynamics - D.J. Griffiths
14. Fundamentals of Physics – Halliday and Resnick