Maharaja Surajmal Brij University

Bharatpur (Raj.)

SYLLABUS

PHYSICS

B.Sc. PAPER I, II & III

Only For Session
2020-21

अकादमिक प्रभारी
महाराजा सूरजमल बृज विश्वविद्यालय
भरतपुर (राज.)

B.Sc, Part 1

1. Physics

Paper I	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Paper II	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Paper III	Exam. 3 Hours Duration	Max. Marks 33	Min. Pass Marks 12
Practical	Exam. 5 Hours Duration	Max. Marks 50	Min. Pass Marks 18

Paper-I (Mechanics)

Work Load: Two hours lecture per week

Examination Duration: 3 Hrs.

Scheme of Examination: Five questions shall be set and all are compulsory First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words Candidates have to attempt any nine questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit Second to fitin questions will have 100% internal choice.

Unit - I

Physical Law and frame of Reference:

Inertial and non-inertial frames: Transformation of displacement, velocity, acceleration between different frames of reference involving translation, Galilean transformation and invariance of Newton's laws.

Coriolis Force: Transformation of displacement velocity and acceleration between rotating frame, Pseudo forces, Coriolis force. Motion relative to earth.

Unit - II

Centre of Mass:

Introduction about Centre of Mass, Centre of Mass Frame, Collision of two particles in one and two dimensions (elastic and inclastic). Slowing down of neutrons in a moderator, Angular momentum concept, conservation and charge particle scattering by a nucleus.

Rigid body

Equation of a motion of a rotating body, Inertial coefficient. Case of not parallel to ω Kinetic energy of rotation and idea of principal axes. Determination of moment of inertia of symmetric bodies using inertial coefficients.

Unit-III

Motion under Central Forces :

Introduction about Central Forces, Motion under central forces, Gravitational interaction Inertial and gravitational mass, General solution under gravitational interaction, Keplers Laws, Discussion of trajectories, Cases of elliptical and circular orbits.

Elastic Properties of Matter

Elastic constants and relations among them, Elastic theorems, Bending of beams and cantilever, Torsion of a cylinder, Experimental determination of Y by bending of beam; η by Maxwell's needle, Y, η and σ by Searle's method & η by static method.

Unit - IV

Damped Harmonic Oscillations:

Introduction about oscillations in a potential well, Damped force and motion under damping, Damped Simple Harmonic Oscillator, Power dissipation, Anharmonic oscillator and simple pendulum as an example.

Driven Harmonic Oscillations

Driven harmonic oscillator with damping, Frequency response, Phase relation, Quality factor, Resonance, Series and parallel of LCR circuit, Electromechanical system-Ballistic Galvanometer.

Reference Books:

1. Mechanics Berkeley Physics Course Vol-1, Charles Kittel
2. Mechanics HS Hans S P Puri, Tata McGraw-Hill
3. The Physics of Waves & Oscillations. N.K. Bajaj, Tata McGraw-Hill
4. Analytical Mechanics L N Hand, J.D. Finch (Cambridge University Press)

Paper - II (Electromagnetism)

Work Load: Two hours lecture per week

Examination Duration: Three hours

Scheme of Examination: Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words. Candidates have to attempt any nine questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit Second to fifth questions will have 100% internal choice.

Unit I

Scalar and Vector Fields Concept of Field, Scalar and Vector Fields :

Gradient of scalar field, Physical significance and formulism of Gradient, Divergence and Curl of a vector field in Cartesian co-ordinates system, Problems based on Gradient, Divergence and curl operators.

Concept of Solid angle, Gauss's divergence and Stokes theorem, Differential and integral form of Gauss's law, Ampere's law and Faraday's law.

Unit II

Fields of stationary and moving charges

Potential energy of system of (i) Discrete N-charges (ii) Continuous charge distribution Energy required to build a uniformly charged sphere, classical radius of electron, Electric field due to a short electric dipole, Interaction of electric dipole with external uniform and non-uniform electric field, potential due to a uniformly charged spherical shell.

Poisson's and Laplace equations in Cartesian co-ordinates and their applications to solve the one dimensional problems of electrostatics.

Unit - III

Electric field in matter

Multipole expansion, definition of moments of charge distribution, Dielectrics, Induced dipole moments, polar & non polar molecules, Free and bound charges, Polarization, Atomic polarizabilty, electric displacement vector, electric susceptibility, dielectric constant, relation between them.

Electric potential and electric field due to a uniformly polarized sphere (1) outside the sphere (ii) at the surface of the sphere (ill) inside the sphere, Electric field due to a dielectric sphere placed in a uniform electric field (a) outside the sphere (b) inside the sphere, Electric field.

due to a charge placed in dielectric medium and Gauss law, Transient behavior of series R-C Circuit with a DC Source.

Unit IV

Magnetostatics and magnetic field in matter

Lorentz force, properties of magnetic field. Ampere's law, magnetic field due to a current carrying solid conducting cylinder outside (i) at the surface and (1) inside the cylinder, Ampere's law in differential form. Introduction of Magnetic Vector potential, Poisson's equation for vector potential, Deduction of Bio-Savart law using Magnetic Vector potentials, Differential form of Ampere's law, Transient behavior of series LR Circuit with a DC Source.

Intensity of Magnetization, Magnetic permeability and Susceptibility, free and bound current densities, Magnetic field due to a uniformly magnetized material and Non-uniformly magnetized material

Reference Books:

1. Electricity & Magnetism, AS Mahajan & Abbas A Rangwala, Tata McGra w-Hill
2. Introduction to electrodynamics, David J Griffith Prentice Hall
3. Berkley Physics Course Vol II
4. Fundamental University Physics Vol II: Fields and Waves M. Alonso and EJ Finn: Addrson-Wesley Publishing Company.

Paper III OPTICS

Work Load: Two hours lecture per week

Examination Duration: Three hours

Scheme of Examination: Five questions shall be set and all are compulsory. First question shall contain 12 short answer type questions (3 questions from each unit) of one mark each with answer to each question not exceeding 50 words Candidates have to attempt any ten questions out of these 12 questions. Remaining four questions will be of 6 marks each and will be set with one question from each unit Second to fifth question will have 100% internal choice.

Unit 1

Interference:

Interference by division of amplitude: Interference in thin films of constant thickness in transmitted and reflected waves Interference produced by a wedge shaped film, Newton's rings, Determination of wavelength and refractive index u by Newton's Rings: fringes of equal inclination (Haidinger fringes) and equal thickness (Fizeau fringes), Michelson's Interferometer, shape of fringes, Measurement of wavelength, difference between two spectral lines and thickness of a thin transparent sheet.

Unit -2

Fresnel's Diffraction:

Fraunhofer diffraction by N parallel slits with two slits as a special case, Missing order, Plane diffraction grating and its use in determining wavelength, Dispersion by a grating. Rayleigh's criterion of resolution, Resolving power of a Telescope and a Grating.

Unit - 3

Polarization:

Polarization, Plane, Circular and Elliptically Polarized light, Polarization by reflection Double refraction and Huygens explanation of double refraction, Production and detection of Plane, Circular and Elliptically Polarized light; Quarter wave and Half wave plates, optical activity. Specific rotation, Biquartz.

(i) LASER: Spontaneous and Stimulated emission Einstein's A&B coefficients Energy density of radiation as a result of stimulated emission and absorption, population Inversion. Methods of Optical pumping, Ruby.

(ii) Holography: Basic concepts of holography, Principle. Theory. Construction and reconstruction of image. Application of holography.

Unit -4

Wave motion:

ID and 3D wave equation, Transverse waves in a stretched string Elastic waves in solids Pressure waves in a gas column, spherical waves. Phase and group velocities. Dispersion of waves. Electromagnetic waves, Energy density of Electromagnetic waves, Electromagnetic waves in an Isotropic and Dispersive medium.

Reference Books:

1. Optics by Brij Lal & Subramanium, S. Chand.
2. Optics by D P Khandelwal.
3. Principles of optics by B K. Mathur.
4. Introduction to Modem Optics by A K. Ghatak.
5. An introduction to Modent Optics by G.R Fowels.
6. Essentials of Lasers by Allen.

Practical

Work Load Four hours laboratory work per week

Examination Duration: Four hours

Minimum Experiments: Total sixteen taking eight from each section.

Perform Any Six experiments from section A/B

1. To study the variation of power transfer by two different loads by a DC source and to verify maximum power transfer theorem.
2. To study the variation of charge and current in a R-C circuit with a different time constant (using a DC source).
3. To study the behavior of a R-C circuit with varying resistance and capacitance using at mains as a power Source and also to determine the impedance and phase relations.

4. To study the rise and decay of current in an L-R circuit with a source of constant emf.
5. To study the voltage and current behavior of an L-R circuit with an AC power source. Also determine power factor, impedance and phase relations.
6. To study the characteristics of a semi-conductor junction diode and determine forward and reverse resistances.
7. To study the magnetic field along the axis of a current carrying circular coil, Plot the necessary graph and hence find radius of the circular coil.
8. To determine the specific resistance of a material and determine difference between two small resistance using Carey Fosters Bridge.
9. To convert a galvanometer into an ammeter of a given range.
10. To convert a galvanometer into a voltmeter of a given range.

Section B

1. To study the random decay and determine the decay constant using the statistical board.
2. Using compound pendulum study the variation of time period with amplitude in large board angle Oscillations.
3. To study the damping using compound pendulum.
4. To study the excitation of normal modes and measure frequency splitting using two coupled oscillators.
5. To study the frequency of energy transfer as a function of coupling strength using coupled oscillators,
6. To study the viscous fluid damping of a compound pendulum and determining damping coefficient and Q of the oscillator.
7. To study the electromagnetic damping of a compound pendulum and to find the variation of damping coefficients with the assistance of a conducting lamina.
8. To find J by Calendar and Barne's Method.
9. To determine Youngs modulus by bending of beam.
10. To determine Y, σ and η by Searle's method'.
11. To ensure Curie temperature of Monel alloy.
12. To determine modulus of rigidity of a wire using Maxwell's needle.
13. Study of normal modes of a coupled pendulum system, Study of oscillations in mixed modes and find the period of energy exchange between the two oscillators.
14. To study variation of surface tension with temperature using Jaeggers method.
15. To study the specific-rotation of sugar solution by polarimeter.

Blue print for setting question paper I & II for B.Sc. part I Physics Examination - 2018

First question is compulsory and is of 10 marks. This question contains 12 short answer type

questions of one mark each. Candidates have to attempt any 10 questions with answer not more than 50 words Second to fifth questions are of six marks each with internal choice.

प्रथम प्रश्न अनिवार्य है और यह 10 अंक का है। इस प्रश्न के अन्तर्गत 12 लघुत्तरात्मक प्रश्न है जिनमें से कोई भी 10 प्रश्न हल करने है जिनका उत्तर 50 शब्दों से अधिक न हो। प्रश्न संख्या 2 से 5 तक प्रत्येक प्रश्न 6 अंक का है जिसमें आन्तरिक विकल्प है।

1. पचास शब्द सीमा में नौ भागों के उत्तर दीजिए।

(i)	(ii)	(iii)	(iv)
(v)	(vi)	(vi)	(viii)
(ix)	(x)	(xi)	(xii)

Unit – I प्रथम इकाई

2. (a)
   (b)

Or/ अथवा

   (a)
   (b)

Unit – II द्वितीय इकाई

3. (a)
   (b)

Or/ अथवा

   (a)
   (b)

Unit – III तृतीय इकाई

4. (a)
   (b)

Or/ अथवा

   (a)
   (b)

Unit – IV चतुर्थ इकाई

5. (a)
   (b)

Or/ अथवा

   (a)
   (b)

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Blueprint for setting question paper III for B.Sc. part I Physics Examination - 2018

First question is compulsory and is of 9 marks. This question contains 12 short answer type

questions of one mark each. Candidates have to attempt any 9 questions with answer not more than 50 words Second to fifth questions are of six marks each with internal choice.

प्रथम प्रश्न अनिवार्य है और यह 9 अंक का है। इस प्रश्न के अन्तर्गत 12 लघुत्तरात्मक प्रश्न है जिनमें से कोई भी 9 प्रश्न हल करने है जिनका उत्तर 50 शब्दों से अधिक न हो। प्रश्न संख्या 2 से 5 तक प्रत्येक प्रश्न 6 अंक का है जिसमें आन्तरिक विकल्प है।

1. पचास शब्द सीमा में नौ भागों के उत्तर दीजिए।

(i)	(ii)	(iii)	(iv)
(v)	(vi)	(vi)	(viii)
(ix)	(x)	(xi)	(xii)

Unit – I प्रथम इकाई

2. (a)
(b)

Or/ अथवा

(a)
(b)

Unit – II द्वितीय इकाई

3. (a)
(b)

Or/ अथवा

(a)
(b)

Unit – III तृतीय इकाई

4. (a)
(b)

Or/ अथवा

(a)
(b)

Unit – IV चतुर्थ इकाई

5. (a)
(b)

Or/ अथवा

(a)
(b)

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