

B.Sc. (Physics) Part-I (Ist and Second Semester)

SCHEME

SESSION 2020-21, 2021-22, 2022-23

Code	Title of Paper	No of Lectures	Max Marks			Examination Time (Hours)
			Total	Ext.	Int.	
SEMESTER -I						
Paper A	Mechanics-I	40	40	30	10	03 HRS.
Paper B	Vibrations and Waves-I	40	40	30	10	03 HRS.
Paper C	Electricity and Magnetism-I	40	40	30	10	03 HRS.
	Practicals	80	30	22	08	03 HRS.
SEMESTER -II						
Paper A	Mechanics-II	40	40	30	10	03 HRS.
Paper B	Vibrations and Waves-II	40	40	30	10	03 HRS.
Paper C	Electricity and Magnetism-II	40	40	30	10	03 HRS.
	Practicals	80	30	22	08	03 HRS.

General Instructions

- 1) There will be three papers of theory and one laboratory (practical) course.
- 2) The number of lectures per week will be three for each theory paper.
- 3) The number of lectures per week will be six for practicals.
- 4) The examination time for each theory will be 3 hours.
- 5) The examination time for practical will also be 3 hours.
- 6) The use of non programmable calculator will be allowed in the examination centre but this will not be provided by the University/College.
- 7) Each theory paper will consist of three sections A,B and C . Section C is compulsory
- 8) Use of scientific non programmable calculator is allowed in practicals also.

SECTION A

There will be four questions. Each question will carry five marks. Two questions are to be attempted

SECTION B

There will be four questions. Each question will carry five marks. Two questions are to be attempted.

SECTION C

There will be seven questions of short answer type covering the whole syllabi. Each question will carry two marks. Any five question to be attempted.

Semester -I

PAPER A: MECHANICS-I

Maximum Marks : External 30
Internal 10
Total 40

Time Allowed: 3 Hours
Total Teaching hours: 40
Pass Marks: 35 %

Out of 40 Marks, internal assessment (based on two mid-semester tests/ internal examination, written assignment/project work etc. and attendance) carries 10 marks, and the final examination at the end of the semester carries 30 marks.

Instruction for the Paper Setter

The question paper will consist of three sections A, B and C . Each of sections A and B will have four questions from respective sections of the syllabus. Section C will have 07 short answer type questions (Candidate is to attempt any five questions), which will cover the entire syllabus uniformly. Each question of sections A and B carry 05 marks. Section C will carry 10 marks of 2 marks each.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from section A and B, and the entire section C is compulsory and Consist of seven questions (Candidate is to attempt any five questions).
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Cartesian and spherical polar co-ordinate systems, area, volume, displacement, velocity and acceleration in these systems, Solid angle, Various forces in Nature (brief introduction), Centre of mass, Equivalent one body problem, Central forces, Equation of motion under central force, Equation of orbit in inverse square, Force field and turning points, Kepler laws and their derivations.

SECTION B

Relationship of conservation laws and symmetries of space and time. Inertial frame of reference. Galilean transformation and invariance, Non-inertial frames of reference, Coriolis force and its applications. Variation of acceleration due to gravity with latitude. Foucault pendulum (qualitative). Elastic collision in Laboratory and C.M.system, velocities, angles and energies, Cross section of elastic scattering . Rutherford scattering (qualitative).

Text Books:

1. Mechanics : Berkeley Physics Course, vol. I by C.Kittel, W.D.Knight and M.A.Ruderman, Mc Graw-Hill Publication
2. Mechanics : H.S.Hans and S.P.Puri, Tata McGraw Hill, New Delhi

Semester –I

PAPER B: VIBRATIONS AND WAVES-I

Maximum Marks : External 30
Internal 10
Total 40

Time Allowed: 3 Hours
Total Teaching hours: 40
Pass Marks: 35 %

Out of 40 Marks, internal assessment (based on two mid-semester tests/ internal examination, written assignment/project work etc. and attendance) carries 10 marks, and the final examination at the end of the semester carries 30 marks.

Instruction for the Paper Setter

The question paper will consist of three sections A, B and C . Each of sections A and B will have four questions from respective sections of the syllabus. Section C will have 07 short answer type questions (Candidate is to attempt any five questions), which will cover the entire syllabus uniformly. Each question of sections A and B carry 05 marks. Section C will carry 10 marks of 2 marks each.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from section A and B, and the entire section C is compulsory and Consist of seven questions (Candidate is to attempt any five questions).
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Simple harmonic motion, energy of a Simple Harmonic Oscillation (SHO). Compound pendulum, Electrical oscillations. Transverse vibrations of a mass on a string, composition of two perpendicular SHM of same period and of period ratio 1 : 2. Anharmonic oscillations. Decay of free vibrations due to damping. Differential equation of motion, types of damping. Determination of damping co-efficient-logarithmic decrement, relaxation time and Q-Factor. Electromagnetic damping (Electrical oscillator).

SECTION B

Differential equation for forced mechanical and electrical oscillators. Transient and steady state oscillation. Displacement and velocity variation with driving force frequency, variation of phase with frequency resonance, Power supplied to an oscillator and its variation with frequency, Q value of a forced oscillator and band width. Q-value as an amplification factor of low frequency response.

Text Books:

1. Physics of Vibrations and Waves by H.J.Pain, Wiley & Sons, New Delhi
2. Fundamentals of Vibrations and Waves by S.P.Puri, Tata McGraw Hill, New Delhi.
3. Waves and Oscillations, by E.Crawford, Berkeley Physics Course, McGraw-Hill Publications.

Semester-I

PAPER C: ELECTRICITY AND MAGNETISM-I

Maximum Marks:	External	30
	Internal	10
	Total	40

Time Allowed:	3 Hours
Total Teaching hours:	40
Pass Marks:	35 %

Out of 40 Marks, internal assessment (based on two mid-semester tests/ internal examination, written assignment/project work etc. and attendance) carries 10 marks, and the final examination at the end of the semester carries 30 marks.

Instruction for the Paper Setter

The question paper will consist of three sections A, B and C . Each of sections A and B will have four questions from respective sections of the syllabus. Section C will have 07 short answer type questions (Candidate is to attempt any five questions), which will cover the entire syllabus uniformly. Each question of sections A and B carry 05 marks. Section C will carry 10 marks of 2 marks each.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from section A and B, and the entire section C is compulsory and Consist of seven questions (Candidate is to attempt any five questions).
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Basic ideas of Vector Calculus, Gradient, Divergence, curl and their physical significance, Laplacian in rectangular. Coulomb's Law for point charges and continuous distribution of charges. Electric field due to dipole line charge and sheet of charge. Electric flux. Gauss's Law and its applications. Gauss's divergence theorem and differential form of Gauss's Law. Green's's theorem.

SECTION B

Work and potential difference. Potential difference as line integral of electric field. Electric potential due to a point charge, a group or point charges, dipole and quadruple moments, long uniformly charged wire, charged disc. Stoke's theorem and its application in Electrostatic field, curl $E=0$. Electric field as gradient of scalar potential. Calculation of E due to a point charge and dipole from potential. Potential due to arbitrary charge distribution and multipole moments. Poisson and Laplace's Equation and their solutions in Cartesian and concept of electrical images. Calculation of electric potential and field due to a point charge placed near an infinitely conducting sheet.

Text Books:

1. Fundamentals of Electricity and Magnetism by Author F.Kipp.
2. Electricity and Magnetism. Berkeley Physics Course. Vol. II by E.M Purcell, McGraw-Hill, 1965.
3. Introduction to classical Electrodynamics by David Griffith.
4. EM waves and Radiating systems by Edward C. Jordan and K.G Balmain.

B.Sc. (Physics)

General Guidelines for Physics Practical Examination

Maximum Marks :	External	22
	Internal	08
	Total	30

1. The student will be asked to perform one experiment out of the experiments mentioned in syllabus.
2. The distribution of marks is as follows :
 - (i) One full experiment requiring the student to take some data, analyse it and draw conclusions-(candidates are expected to state their results with limits of error. (10)
 - (ii) Brief theory (04)
 - (iii) Viva-Voce (04)
 - (iv) Record(Practical File) (04)
3. There will be one session of 03 hours duration. The paper will consist of 06 experiments out of which an examinee will mark 04 experiments and one of these is to be allotted by the external examiner.
4. Number of candidates in a group for practical examination should not exceed 12.
5. In a single group no experiment be allotted to more than three students in any group.
6. The student should determine Standard Deviations and probable error in the calculations where needed.

Semester- I

(75 Hours)

1. Analysis of experimental data by :
 - i) Fitting of given data to a straight line.
 - ii) Calculation of probable error.
2. To establish relationship between torque and angular acceleration using fly wheel and hence to find inertia of flywheel.
3. To determine the Young's Modulus by bending of beam.
4. To study one-dimensional collision using two hanging spheres of different materials.
5. Determination of Poisson's ratio for rubber.
6. Study the dependence of moment of inertia on distribution of mass (by noting time periods of oscillations) using objects of various geometrical shapes but of same mass.
7. To set up CRO for Sine and Square wave and to find their frequency and amplitude.
8. Study the dependence of solenoidal field on number of turns and current.
9. To study the magnetic field produced by a current carrying solenoid using a search coil and to find the value of permeability of air.
10. To determine the value of air capacitance by de-Sauty method and to find the permittivity of air and also to determine the dielectric constant of medium.
11. To study the efficiency of an electric kettle/heater element with varying input voltages.
12. To study the working of energy meter.

Text and Reference Books:

1. B.Sc. Practical Physics, By C.L.Arora, S.Chand & Co.
2. A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal

Semester –II

PAPER A: MECHANICS-II

Maximum Marks : External 30
Internal 10
Total 40

Time Allowed: 3 Hours
Total Teaching hours: 40
Pass Marks: 35 %

Out of 40 Marks, internal assessment (based on two mid-semester tests/ internal examination, written assignment/project work etc. and attendance) carries 10 marks, and the final examination at the end of the semester carries 30 marks.

Instruction for the Paper Setter

The question paper will consist of three sections A, B and C . Each of sections A and B will have four questions from respective sections of the syllabus. Section C will have 07 short answer type questions (Candidate is to attempt any five questions), which will cover the entire syllabus uniformly. Each question of sections A and B carry 05 marks. Section C will carry 10 marks of 2 marks each.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from section A and B, and the entire section C is compulsory and Consist of seven questions (Candidate is to attempt any five questions).
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Rigid body motion: Rotational motion, principal moments and axes. Euler's equations; precession and elementary gyroscope. Galilean transformation and Invariance, Non-Inertial frames, concept of stationary universal frame of reference and ether. Michelson-Morley experiment and its result.

SECTION B

Postulates of special theory of relativity. Lorentz transformations, Observer and viewer in relativity. Relativity of simultaneity. Length, Time, Velocities, Relativistic Doppler effect. Variation of mass with velocity, mass-energy equivalence, rest mass in an inelastic collision, Relativistic momentum and energy, their transformation, concepts of Minkowski space, four vector formulation.

Text Books:

1. Mechanics : Berkeley Physics Course, vol. I by C.Kittel, W.D.Knight and M.A.Ruderman, Mc Graw-Hill Publication
2. Mechanics : H.S.Hans and S.P.Puri, Tata Mc Graw Hill Publication, New Delhi

Semester -II

PAPER B: VIBRATIONS AND WAVES-II

Maximum Marks :	External	30
	Internal	10
	Total	40

Time Allowed: 3 Hours
Total Teaching hours: 40
Pass Marks: 35 %

Out of 40 Marks, internal assessment (based on two mid-semester tests/ internal examination, written assignment/project work etc. and attendance) carries 10 marks, and the final examination at the end of the semester carries 30 marks.

Instruction for the Paper Setter

The question paper will consist of three sections A, B and C . Each of sections A and B will have four questions from respective sections of the syllabus. Section C will have 07 short answer type questions (Candidate is to attempt any five questions), which will cover the entire syllabus uniformly. Each question of sections A and B carry 05 marks. Section C will carry 10 marks of 2 marks each.

Instruction for the candidates

- 1) Candidates are required to attempt two questions each from section A and B, and the entire section C is compulsory and Consist of seven questions (Candidate is to attempt any five questions).
- 2) Use of non programmable calculator is allowed in the examination centre but this will not be provided by the University/College.

SECTION A

Stiffness coupled oscillators. Normal co-ordinates and normal modes of vibration. Inductance coupling of electrical oscillators, Types of waves, Wave equation (transverse) and its solution, The string as a forced oscillator, Characteristic impedance of a string. Impedance matching. Reflection and transmission of energy, Reflection and Transmission Energy, Reflection and transmission of string, wave and group velocity. Standing waves on a string of fixed length. Energy of vibrating energy string,wave and group velocity.

SECTION B

Physical interpretation of Maxwell's equations. Electromagnetic waves and wave equation in a medium having finite permeability and permittivity but with conductivity $\hat{\rho}=0$. Pointing vector. Impedance of a dielectric to EM waves, EM waves in a conducting medium and skin depth. EM waves velocity in a conductor an anomalous dispersion. Response of a conducting medium of EM waves. Reflection and transmission of EM waves at a boundary of two dielectric media for normal incidence. Reflection of EM waves from the surface of a conductor at normal incidence.

Text Books:

1. Fundamentals of Vibrations and Waves by S.P.Puri, Tata McGraw Hill, New Delhi.
2. Physics of Vibrations and Waves by H.J.Pain, Wiley & Sons, New Delhi
3. Waves and Oscillations, by E.Crawford, Berkeley Physics Course, McGraw-Hill Publications, New Delhi.
4. EM Waves and Radiating Systems by Edward C.Jordan and K.G.Balmain, Prentice Hall of India, New Delhi.

Semester-II

PAPER C: ELECTRICITY AND MAGNETISM-II

Maximum Marks:	External	30
	Internal	10
	Total	40

Time Allowed: 3 Hours
Total Teaching hours: 40
Pass Marks: 35 %

Out of 40 Marks, internal assessment (based on two mid-semester tests/ internal examination, written assignment/project work etc. and attendance) carries 10 marks, and the final examination at the end of the semester carries 30 marks.

Instruction for the Paper Setter

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- 1) Candidates are required to attempt two questions each from section A and B, and the entire section C is compulsory and Consist of seven questions (Candidate is to attempt any five questions).
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SECTION A

Current and current density, equation of continuity. Microscopic form of Ohm's Law. ($J = \sigma E$) and conductivity. Failure of Ohm's Law. Invariance of charge. E in different frames of reference. Field of a point charge moving with constant velocity. Interaction between moving charges and force between parallel currents. Behaviour of various substances in magnetic field. Definition of M and H and their relation to free and bound currents. Permeability and susceptibilities and their inter-relationship. Orbital motion of electrons and diamagnetism. Electron spin and paramagnetism. Ferromagnetism. Domain theory of Ferromagnetism. Hysteresis Loss. Magnetisation curve. Ferrites..

SECTION B

Lorentz's force. Definition of B. Biot Savart's Law and its applications to long straight wire, circular current loop and solenoid. Ampere's Circuital law and its application. Divergence and curl of B. Hall effect expression and co-efficient. Vector potential, Definition and derivation of current density-definition its use in calculation or change in magnetic field at a current sheet. Transformation equation or E and B from one frame to another. Faraday's Law of EM induction. Displacement current. Maxwell's equations. Mutual inductance and reciprocity theorem. Self inductance L for solenoid. Coupling of Electrical circuits. Analysis of LCR series and parallel resonant circuits. Q-factor. Power consumed power factor..

Text Books:

1. Fundamentals of Electricity and Magnetism by Author F.Kipp.
2. Electricity and Magnetism. Berkeley Physics Course. Vol. II by E.M Purcell, McGraw-Hill, 1965.
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B.Sc. (Physics)

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4. Number of candidates in a group for practical examination should not exceed 12.
5. In a single group no experiment be allotted to more than three students in any group.
6. The student should determine Standard Deviations and probable error in the calculations where needed.

Practical Semester II

(75 hours)

1. To study the variation of time period with distance between centre of suspension and centre of gravity for a bar pendulum and to determine
 - i) Radius of gyration of bar pendulum about an axis through its Centre of Gravity and perpendicular to its length.
 - ii) Value of Centre of Gravity, g .
2. Determination of g by Kater's pendulum.
3. Determination of modulus of rigidity of material of a wire using Maxwell's needle.
4. Measurement for logarithmic decrement, co-efficient of damping, relaxation time and quality factor of a damped simple pendulum.
5. To determine the frequency of AC mains using a sonometer and an electro magnet.
6. To determine the low resistance using Carey Foster Bridge.
7. Determination of unknown capacitance by flashing and quenching of neon lamp.
8. Study the phase relationships between voltage and current using impedance triangle.
9. To study the resonance in series and parallel LCR circuits for different resistances and calculate Q-value.
10. To determine the given inductance by Anderson's bridge.
11. Verify laws of electromagnetic induction.
12. To study the induced emf as function of velocity.

Text and Reference Books:

1. B.Sc. Practical Physics, By C.L.Arora, S.Chand & Co.
2. A Laboratory Manual of Physics for undergraduate classes by D.P.Khandelwal

**B.SC. (PHYSICS) PART-I (Ist & IInd SEMESTER
SESSION 2020-21, 2021-22, 2022-23**

PAPER A : Mechanics -I

PAPER A : Mechanics-II

- 1 Dr. Manjitinder Kaur,
Department of Physics, Govt. Mohindra College, Patiala.
Mobile No: 94179-76418
- 2 Dr. Makhan Singh,
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Mobile No : 98154-92001
- 3 Dr. Gurdeep Singh Sekhon
Department Of Physics, Govt. College, Mohali.
Mobile No : 98882-89101
- 4 Dr. Harvinder Singh ,
Department of Physics, Govt. Ripudman College, Nabha.
Mobile No 95017-58600
- 5 Surinder Singla
Department of Physics,
Govt. Ranbir College, Sangrur, Cell No. 9417383906
- 6 Dr. Baljit Singh,
Department of Physics, Khalsa College, Bela.
Mobile No 98149-26827

PAPER B : VIBRATIONS AND WAVES-I

PAPER B : VIBRATIONS AND WAVES-II

- 1 Dr. Manju Midha,
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- 2 Dr. Harvinder Singh,
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- 3 Professor Harjinder Singh Mann,
Department of Physics, Govt. Rajindra College, Bathinda.
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- 4 Dr. Meera Rani,
Department of Physics, Govt. College, Ropar.
Mobile No : 94175-90982
- 5 Dr. Gurdeep Singh Sekhon
Department of Physics, Govt. College Mohali.
Mobile No: 98882-89101
- 6 Professor Jatinder Singh Gill,
Department of Physics, Govt. College, Ropar
Mobile No 81460-22995.

- 7 Professor Harpal Kaur,
Department of Physics, Govt. Mohindra College, Patiala
Mobile No : 977791-73989
- 8 Dr. Makhan Singh
Department of Physics, Govt. Rajindera College, Bathinda
Mobile No. 98154-92001
- 9 Dr. Manjitinder Kaur,
Department of Physics, Govt. Mohindra College, Patiala
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Paper C Electricity and Magnetism-I

Paper C Electricity and Magnetism-II

- 1 Dr. Makhan Singh
Department of Physics, Govt. Rajindera College, Bathinda
Mobile No. 98154-92001
- 2 Professor Ravinder Singh,
Department of Physics, Govt. Mohindra College, Patiala.
Mobile No : 94170-96353
- 3 Surinder Singla
Department of Physics,
Govt. Ranbir College, Sangrur,
Cell No. 9417383906
- 4 Professor Jatinder Singh Gill,
Department of Physics, Govt. College, Ropar.
Mobile No : 8146022995
- 5 Dr. Meera Rani,
Department of Physics, Govt. College, Ropar
Mobile No : 9417590982
6. Dr. Lovleen
Department of Physics, Govt. College for Women, Patiala.
Mobile No : 98147- 15350

PRACTICALS

1. Mrs. Manjitinder Kaur,
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2. Dr. Makhan Singh,
Department of Physics, Govt. Rajindra College, Bathinda. Mobile: 98154 92001
3. Dr. Gurdeep Singh Sekhon
Department of Physics, Govt. College, Mohali. Mobile: 988828 89101
4. Dr. Harvinder Singh ,
Department of Physics, Govt. Ripudman College, Nabha. Mobile: 950175-8600
5. Mr. B.S. Stayal,
Department of Physics, Govt. College Ropar. Mobile: 94170 22131
6. Dr. Gurpreet Singh
Department of Physics, DAV College Bathinda.
7. Dr. Baljit Singh
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10. Mr. Harjinder Singh Mann,
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11. Mr. Ravinder Singh,
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12. Dr. Loveleen,
Department of Physics, Govt. College for Women, Patiala. Mobile: 98147 15350
13. Dr. Jagdish Singh,
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14. Mrs. Anoop Kaur
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15. Mr. Jatinder Singh Gill,
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16. Dr. Manjit Singh Saini,
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17. Dr. Meera Rani,
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18. Mr. Joginder Singh Batra,
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Guru Kashi College, Talwandi Sabo, Mobile No : 94170-67792
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- 21 Dr. Tajinder Singh
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- 22 Surinder Singla
Department of Physics, Govt. Ranbir College, Sangrur, Cell No. 9417383906