## Session (2022-2023)

## Subject : Physics

## B.Sc . First Year : Semester Mode

## First Semester

**Paper :** Mechanics

**MM 100 (75 External +25 Internal Assessment )**

**Practical** (100 Marks)

## Second Semester

**Paper:** Electricity and Magnetism

**MM 100 (75 External +25 Internal Assessment )**

**Practical** (100 Marks)

## B.Sc. 1st Semester (2022-2023)

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|---|---|---|---|
| **Programme:** *Certificate Course in Basic Physics* | | **Year: I** | **Semester: I Paper-I** |
| **Subject: Physics** | | | |
| **Course Code:** | **Course Title: Mechanics** | | |

**Course Outcomes**

1. Understanding of Vector Algebra and Vector Calculus.
2. Understand the physical interpretation of gradient, divergence and curl.
3. Study of gravitational field and potential and understanding of Kepler's laws of Planetary motion.
4. Understanding of different frames of references and conservation laws.
5. Understand the dynamics of rigid body and concept of moment of inertia. Study of moment of inertia of different bodies and its applications.
6. Study the properties of matter, response of the classical systems to external forces and their elastic deformation and its applications.
7. Comprehend the dynamics of Fluid and concept of viscosity and surface tension along with its applications.

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| **Credits: 04** | **Core Compulsory** |
| **Max. Marks: 100**<br>**External Exam: 75**<br>**Internal Assessment : 25** | **Min. Passing Marks: 33** |

**Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0**

| Unit | Topic | No. of Lectures |
|---|---|---|
| **Unit I** | **Vectors Algebra**<br>Vector algebra. Scalar and vector products, scalar and vector triple products, Derivative of a vector with respect to a parameter, Del operator, gradient, divergence and curl, Gauss divergence theorem, Stokes curl theorem and Green's theorem, Line, surface and volume integral of a vector function. | **10** |
| **Unit II** | **Gravitation field and potential**<br>Gravitational field and potential, Gravitational potential energy, Gravitational field Intensity and potential due to a ring, a spherical shell, solid sphere and circular disc, gravitational self-energy, Inverse square law of forces, Kepler's laws of planetary motion. | **10** |

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|---|---|---|
| **Unit III** | **Conservation Laws**<br>Frames of reference, Concept of inertial and Non-inertial frames of references, Work energy theorem, Conservative and non-Conservative forces, Linear restoring force, Gradient of potential, Conservation of energy for the particle; Energy function, Concept of Centre of mass, Angular momentum and torque, Laws of conservation of total energy, total linear momentum and total angular momentum along with their examples. | **15** |
| **Unit IV** | **Dynamics of rigid body and Moment of Inertia**<br>Translatory and Rotatory motion, Equation of motion for Rotating rigid body, angular momentum vector and moment of inertia, Theorem of parallel and perpendicular axes, Moment of inertia of a cylinder, rod, lamina, ring, disc, spherical shell, solid sphere, kinetic energy of rotation, rolling along a slope, Application to compound pendulum. | **10** |
| **Unit V** | **Properties of Matter**<br>Basic concept, Elastic constants and their Interrelations, torsion of cylinder, bending of beam, bending moment, Cantilever, shape of Girders/ rail tracks. Viscosity, Stokes's law, Posieuille's formula, Equation of continuity, Bernoulli's theorem, Surface tension and its molecular interpretation. | **15** |

**Suggested Reading**


1.R. Resnick and D. Hilliday
: Physics Vol-I 2.Berkeley
Physics Course : Mechanics
Vol-I
3.R.P. Feynman, R.B.Lightan and M.Sand : The Feynman Lectures in Physics
4.D.S. Mathur : Mechanics
5.D.S. Mathur : Elements of Properties of Matter
6. Murray Spiegel, Seymour Lipschutz, Dennis Spellman,
"Schaum's Outline Series: VectorAnalysis", McGraw Hill, 2017.
7. J. C. Upadhaya: Mechanics, S. Chand

**CERTIFICATE COURSE IN BASIC PHYSICS**

| **Programme:** *Certificate Course in Basic Physics* | **Year: I** | **Semester: I Practical** |
|---|---|---|

**Subject: Physics (Practical)**

| **Course Code** | **Course Title:** Mechanical Properties of Matter (Practical) |
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**Course Outcomes:**

1. Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the mechanical properties.
2. Measurement precision and perfection is achieved through Lab Experiments.

| **Credits: 02** | **Core Compulsory** |
|---|---|
| **Max. Marks: 50**<br>**Internal (Record File): 15**<br>**External Practical Exam: 20**<br>**External Viva Voce : 15** | **Min. Passing Marks: 17** |

**Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4**

| **Unit** | **Topic** | **No. of Lectures** |
|---|---|---|
| | **Lab Experiment List** | |
| | 1. To study the Motion of Spring and calculate (a) Spring constant, (b) g and (c) Modulus of rigidity.<br>2. To determine the Moment of Inertia of a Flywheel.<br>3. To determine g and velocity for a freely falling body using Digital Timing Technique.<br>4. To determine Coefficient of Viscosity of water by Capillary Flow Method (Poiseuille's method).<br>5. To determine the Young's Modulus of a Wire by Optical Lever Method.<br>6. To determine the Young's Modulus by bending of beam.<br>7. To determine the Modulus of Rigidity of a Wire by Maxwell's needle. To determine the elastic Constants of a wire by Searle's method.<br>8. To determine the value of g using Bar Pendulum.<br>9. To determine the value of g using Kater's Pendulum.<br>10. To determine Surface Tension. | **60** |

**Suggested Readings:**


1. B.L. Worsnop, H.T. Flint, “Advanced Practical Physics for Students”, Methuen & Co., Ltd.,London, 1962.
2. S. Panigrahi, B. Mallick, “Engineering Practical Physics”, Cengage Learning India Pvt. Ltd.,2015.
3. Indu Prakash: Practical Physics
4. S.L. Gupta, V. Kumar, “Practical Physics”, Pragati Prakashan, Meerut, 2014.

**CERTIFICATE COURSE IN BASIC PHYSICS**

| **Programme:** *Certificate Course in Basic Physics* | **Year: I** | **Semester: II Paper-I** |
|---|---|---|

**Subject: Physics**

| **Course Code:** | **Course Title: Electricity and Magnetism** |
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**Course Outcomes:**

**1.** Understanding of Electric Field and Potential. Evaluation of Electric Field and Potential for different types of charge distributions.
**2.** Study of Electric and Magnetic Fields in matter. Understand the concept of polarizability, Magnetization and Electric Displacement Vector.
**3.** Study of Steady and Varying electric currents.
**4.** Understanding of different aspects of alternating currents and its applications.
**5.** Understand the Magnetostatics, Lorentz Force and Energy stored in magnetic Field.
**6.** Comprehend the different aspects of Electromagnetic induction and its applications.

| **Credits: 04** | **Core Compulsory** |
|---|---|
| **Max. Marks: 100**<br>**External Exam: 75**<br>**Internal Assessment : 25** | **Min. Passing Marks: 33** |

**Total No. of Lectures-Tutorials-Practical (in hours per week): 4-0-0**

| **Unit** | **Topic** | **No. of Lectures** |
|---|---|---|
| **Unit I** | **Electric field and potential**<br>Coulomb law, Gauss' theory, its integral and differential forms, line integral of Electric field, Electric field and potential due to an arbitrary charge distribution. Electrostatic energy, energy stored in an Electric field. Electric field and potential due to long charged wire, Spherical shell, sphere, disc, dipole. | **15** |
| **Unit II** | **Electric and Magnetic fields in Matter**<br>Moments of charge distributions, Polar and non-polar molecule, polarization vector, electric displacement vector, three electric vectors, dielectric susceptibility and permittivity, polarizability, Clausius-Mossotti relation Magnetization, magnetic susceptibility, diamagnetic, paramagnetic and ferromagnetic substances, Hysteresis and B-H curve, Langevin's theories of Diamagnetism and paramagnetism, Weiss theory of ferromagnetism. | **15** |
| **Unit III** | **Electric Currents (Steady and Varying)**<br>Current density, Equation of Continuity, Ohm's law and electrical conductivity, LorentzDrude theory, Wiedmann-Frenz law, Kirchhoff's laws | **10** |

| CERTIFICATE COURSE IN BASIC PHYSICS | | |
|---|---|---|
| **Unit IV** | **Magnetostatics**<br>Lorentz force, Bio-Savert's law, Ampere's law, Application of Biot-Saver law, magnetic field due steady current in a long straight wire, Interaction between two wires, field due a Helmholtz coil, solenoid and current loop, magnetic vector potential, permeability, Energy stored in Magnetic field. | **10** |
| **Unit V** | **Electromagnetic Induction and Alternating Current**<br>Faraday's laws of induction, Lenz's law, Electromotive force, Measurement of magnetic field, Eddy current, Mutual inductance, Self-inductance. Impedance, admittance and reactance, R-C, R-L and L-C circuits with alternating e.m.f. source, series and parallel L-C-R circuits, resonance and sharpness, Quality factor, Power in A. C. circuits, Choke coil. | **10** |

**Suggested Reading**


**1.** Edward M. Purcell : Electricity and Magnetism

**2.** J.H. Fewkes&J.Yarwood : Electricity & Magnetism, Vol. I

**3.** D C Tayal : Electricity and Magnetism ", Himalaya Publishing House Pvt. Ltd., 2019.

**4.** D.J.Griffiths : Introduction to Electrodynamics .

**5.** Lal and Ahmed : Electricity and Magnetism

**6.** H. K. Malik and A.K. Singh "Engineering Physics", McGraw Hill Education (India) PrivateLimited, 2018.

**7.** Richard P. Feynman, Robert B. Leighton, Matthew Sands, "The Feynman Lectures on PhysicsVol. 2", Pearson Education Limited, 2012.

| Programme: *Certificate Course in Basic Physics* | Year: I | Semester: II Practical |
|---|---|---|
| **Subject: Physics (Practical)** | | |
| **Course Code:** | **Course Title:** Demonstrative Aspects of Electricity & Magnetism (Practical) | |

**Course Outcomes:**

1. Experimental physics has the most striking impact on the industry wherever the instruments are used to study and determine the electric and magnetic properties.
2. Measurement precision and perfection is achieved through Lab Experiments.

| | |
|---|---|
| **Credits: 02** | **Core Compulsory** |
| **Max. Marks: 50**<br>**Internal (Record File): 15**<br>**External Practical Exam: 20**<br>**External Viva Voce : 15** | **Min. Passing Marks: 17** |

**Total No. of Lectures-Tutorials-Practical (in hours per week): 0-0-4**

| Unit | Topic | No. of Lectures |
|---|---|---|
| | **Lab Experiment List** | |
| | 1. Frequency of A.C. Mains.<br>2. Calibration of Voltmeter by potentiometer.<br>3. Calibration of ammeter by potentiometer.<br>4. Specific resistance determination.<br>5. Conversion of a Galvanometer into a Voltmeter.<br>6. Conversion of a Galvanometer into Ammeter.<br>7. Variation of magnetic field along the axis of a current carrying circular coil.<br>8. Comparison of capacities by Ballistic Galvanometer.<br>9. Determination of Ballistic Constant.<br>10. Electrochemical equivalent.<br>11. De Sauty's bridge- C1/ C2<br>12. R1/R2 by potentiometer.<br>13. Study of R-C, L-C-R circuits.<br>14. Determination of self inductance, mutual inductance.<br>15. Magnetic field determination by search coil and ballistic galvanometer. | **60** |

**Suggested Readings:**


1. B.L. Worsnop, H.T. Flint, "Advanced Practical Physics for Students", Methuen & Co., Ltd.,London, 1962.
2. S. Panigrahi, B. Mallick, "Engineering Practical Physics", Cengage Learning India Pvt. Ltd.,2015.