

Punyashlok Ahilyadevi Holkar Solapur University, Solapur



Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: Physics

Name of the Course: B.Sc. I (Sem.–I & II)

(Syllabus to be implemented from June 2022)

Punyashlok Ahilyadevi Holkar Solapur University, Solapur

B.Sc. Part – I, PHYSICS

Preamble:

The systematic and planned curricula for first year students shall motivate and encourage them for pursuing higher studies in Physics and for becoming an entrepreneur.

Objectives:

- To provide knowledge of scientific and technological aspects of Physics.
- To familiarize with current and recent scientific and technological developments.
- To enrich knowledge through problem solving, hands on activities, study visits, projects etc.
- To create foundation for research and development in Physics.
- To help students build-up a progressive and successful career in Physics

Eligibility:

1. First Year B.Sc.: Higher Secondary School Certificate (10+2) Science stream or its equivalent Examination as per the Punyashlok Ahilyadevi Holkar Solapur University, Solapur eligibility norms.
2. Reservation and relaxation will be as per the Government rules.

B. Sc. I Physics

Equivalent Subjects/Papers for OLD Syllabus (w.e.f. June 2022)

Sr. No.	Name of OLD Paper wef- 2019	Name of the New Paper wef- 2022
1.	Mechanics and Properties of Matter	Mechanics and Properties of Matter
2.	Optics and Laser	Optics
3.	Heat and Thermodynamics	Heat and Thermodynamics
4.	Electricity, Magnetism and Basic Electronics	Electricity, Magnetism and Basic Electronics

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**Nature of Question Paper for choice based credit system (CBCS) Semester
Pattern**

• Faculty of Science •

(w. e. f. June 2022)

Time: - 2 hrs. Total Marks-40

Instructions:

1. All questions are compulsory.
2. Draw neat diagrams and give equations wherever necessary.
3. Figures to the right indicate full marks.
4. Use of logarithmic table and calculator is allowed.

Q. No.1) Multiple choice questions (08)

1) -----

a) b) c) d)

2)

3)

4)

5)

6)

7)

8)

Q.No.2) Answer any four of the following (08)

- i)
- ii)
- iii)
- iv)
- v)
- vi)

Q.No.3 A) Write notes on any one of the following (03)

- i)
- ii)

B) Solve / short answer (05)

Q. No.4) Answer any Two of the following (08)

- i)
- ii)
- iii)

Q.No.5) Answer any one of the following (08)

- i)
- ii)

NB: Minimum two numerical type sub questions must be asked in question number 1 and 2.

One each from question number 3A, and 4 must be of numerical type sub question.

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B.Sc. Part – I Semester I

Core Paper- DSC 1A, Physics Paper: I

Title of the paper: MECHANICS AND PROPERTIES OF MATTER

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

Unit- I

1. Moment of Inertia (5)

Review of M.I., Moment of Inertia of 1) Circular disc 2) Rectangular lamina 3) Spherical Shell 4) Fly wheel, problems.

2. Pendulums and Oscillations (6)

Introduction, Theory of compound pendulum, Bar pendulum, Kater's Pendulum, Bessel's Theory, Bifilar pendulum (parallel suspensions of equal lengths), Torsional Pendulum, problems.

Simple harmonic motion. Differential equation of SHM and its solutions. Kinetic and Potential Energy, Total Energy and their time averages. Damped oscillations, problems.

3. Elasticity (7)

Introduction, Equivalence of shear strain to compression and extension strains, Relation between elastic constants, Poisson's ratio of rubber tube (Theory and experimental method)

Hook's law and coefficient of elasticity, Young's modulus, Bulk modulus and Modulus of rigidity, Work done during longitudinal strain, volume strain, and shearing strain, Poisson's ratio, Relation between three elastic moduli (Y , η , K), Determination of Y of rectangular thin bar loaded at the centre, Torsional oscillations, Rigidity of a wire by torsional oscillations, problems

Unit- II

4. Surface Tension (6)

Review of S.T., Angle of contact and wettability, Capillary Rise Method, relation between excess pressure and surface tension, excess pressure inside a liquid drop and soap bubble, Jaeger's method to determine Surface Tension, Factors affecting Surface Tension, Applications of Surface Tension, problems.

5. Viscosity and Fluid dynamics (6)

Introduction, Newton's law of viscosity, streamline and turbulent flow, Critical velocity and Reynolds number, Equation of continuity, Energy possessed by liquid, Poiseuille's equation, Bernoulli's theorem and its applications to 1) Venturimeter 2) Atomiser. Factors affecting on viscosity, problems.

Reference books:-

- 1) Properties of matter- D.S. Mathur
- 2) A Text book of properties of matter- N.S. Khare & S.Kumar
- 3) Physics Vol.I –David & Robert Resnick
- 4) University Physics-Mechanics of a particle- Anvar Kamal
- 5) Mechanics Berkeley Physics course,v.1: Charles Kittel, et. Al. 2007, Tata McGraw Hill.
- 6) Concepts of Physics: H.C. Varma, Bharati Bhavan Publishers

Learning Outcomes:

On successful completion of this course students will be able to do the following:

1. Understanding the concept of Moment of Inertia and applying them in calculations of the moment of inertia of various systems.
2. Understand the physics and mathematics of oscillations and to solve the equations of motion for simple harmonic and damped oscillators
3. Understand the concepts of energy, work, power, the concepts of conservation of energy and be able to perform calculations using them.
4. Understand the concepts of elasticity and be able to perform calculations using them.
5. Understand the concepts of surface tension and viscosity and be able to perform calculations using them.
6. Understand the concepts of viscosity & fluid dynamics and its application in real life problems.
7. Demonstrate quantitative problem solving skills in all the topics covered.

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B.Sc. Part – I Semester I

Core Paper- DSC 1A, Physics Paper: II

Title of the paper: OPTICS

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

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Unit- I:

1: Geometrical Optics and Aberrations (7)

Introduction, Fermat's Principle, Deduction of law of reflection by Fermat's Principle, Types of lenses, Chromatic and spherical aberrations, Methods to minimize chromatic and spherical aberrations, Problems

2: Optical Instruments (5)

Introduction, Types of eye-pieces, Ramsden eye piece, Huygens eye-piece, Comparison between Ramsden and Huygens eye-piece, Spectrometer and optical bench (Construction, working and applications), Problems

3: Interference (6)

Introduction, Interference of light by division of amplitude, Interference in parallel faced thin film (reflected only), Wedge shaped thin film, Newton's rings and its applications, Problems

Unit- II:

4: Diffraction (7)

Introduction, Types of diffraction, Distinguish between Fresnel and Fraunhofer diffraction, Schuster's method, Plane diffraction grating, Comparison between prism and grating spectra, Determination of wavelength of light using diffraction grating, Distinguish between interference and diffraction, problems

5: Laser

(5)

Introduction, Three quantum processes, Einstein Coefficients, Population inversion, Metastable state, Important components of laser, Types of laser, He-Ne and Ruby laser, Properties and applications of laser, Problems.

Reference Books:

1. Ray Optics by R. K. Verma
2. Text book of Optics (new edition) Brijlal and Subramanyam
3. Optics 2nd edition – Ajay Ghatak TataMcGraw Hill
4. Concept of Physics – H. C. Verma
6. Optics by Murugesan, S. Chand & Co.
7. Introduction to laser by Avadhanulu, S. Chand & Co.

Course Outcomes:

On successful completion of this course student will be able to:

- ✓ Understand technical applications of simple optical instruments.
- ✓ Understand and explain the different optical method of testing and measuring of various physical parameters
- ✓ Understand Fermat's principle, explain about different aberrations in lenses and discuss the method to minimize them.
- ✓ Understand the types of eyepieces and construction and working of spectrometer and optical bench for determining various optical values.
- ✓ Understand the phenomenon of interference of light and its formation in thin film, Newton's ring, wedge shaped film etc. due to division of amplitude.
- ✓ Explain Schuster method, Distinguish between diffraction and interference patterns, prism and grating spectra
- ✓ Comprehended the basic principle of laser and its parts, the construction and working of He-Ne and Ruby laser.
- ✓ Solve problems using suitable assumptions and formulae as well as able to assess the results.

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B.Sc. Part – I Semester II

Core Paper- DSC 1B, Physics Paper: III

Title of the paper: HEAT AND THERMODYNAMICS

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

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Unit- I

1. Transport Phenomenon (6)

Introduction, mean free path, Clausius expression for mean free path (mutual collision cross section approximate method), Transport Phenomenon, Coefficient of Viscosity, Thermal Conductivity and its dependence on temperature and pressure, Diffusion (without derivation) Problems

2. Liquefaction of Gases (6)

Liquefaction of gases by J-T effect, Linde's air liquefier; Cooling by adiabatic demagnetization and expression for fall in temperature, Experimental setup for adiabatic demagnetization of paramagnetic substances, Properties of liquid helium-II, Problems.

3. Thermodynamics (6)

Laws of thermodynamics, Reversible and Irreversible processes, Isothermal and adiabatic process, Adiabatic relations, Work done during isothermal and adiabatic processes, Entropy change in reversible and irreversible processes, Problems

Unit- II

4. Heat engines (6)

Introduction, Heat engine, Carnot's heat engine and its efficiency, Otto cycle and its efficiency Diesel cycle and its efficiency, Comparison between Otto and Diesel engine, Problems

5. Refrigerator

(6)

Introduction, Refrigeration Cycle, Coefficient of performance of refrigerator, Vapor compression Refrigerator, Air conditioning (principle and applications), Problems

Reference books:

1. Treatise on heat – Saha & Shrivastav
2. Kinetic theory of gases – V.N. Kelkar
3. Heat and Thermodynamics – Brijlal & Subrahmanyam

Learning Outcomes:

After successfully completing this course, the student will be able to do the following:

1. Determination of Coefficient of Viscosity, Thermal Conductivity and Diffusion.
2. Understand Liquefaction of gases by various methods and Properties of Liquid He-II.
3. Apply the laws of thermodynamics to formulate the relations necessary to analyze a thermodynamic process.
4. Analyse the heat engines and calculate thermal efficiency.
5. Analyze the refrigerators and calculate coefficient of performance.
6. Understand property 'entropy' and derive some thermo dynamical relations using entropy concept.

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B.Sc. Part – I Semester II

Core Paper- DSC 1B, Physics Paper: IV

**Title of the paper: ELECTRICITY, MAGNETISM AND BASIC
ELECTRONICS**

Theory: 30 Contact Hours Marks: 50; [UA: 40 and CA: 10] (Credits: 2.0)

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Unit I

1. Varying Current: (6)

Introduction, Growth and decay of current in L R circuit, charging and discharging of capacitor through resistor and inductor separately. Time constant of the L R and CR circuits. Problems.

2. A.C. Circuits: (6)

Complex number, J-Operator and its applications to AC circuits, Reactance, Susceptance, Impedance, Admittance and power factor, L-C-R circuit, Series and parallel resonance circuits, Sharpness of resonance and quality factor, Owen's bridge, Problems.

3. Magnetostatics and Ballistic Galvanometer: (6)

Introduction, Biot and Savart's law & its application to determine magnetic induction at a point on the axis of current carrying coil of single turn and solenoid.
Ballistic Galvanometer: Construction, Theory and working of Ballistic Galvanometer, Damping in the B G, Constants of BG, Problems.

Unit II

4. Electronic Devices: (6)

Introduction, Rectifiers, Bridge rectifier with π -filter, Clippers, Clampers, Zener diode and its application as a voltage regulator, Problems.

5. Bi-Junction Transistor (BJT):

(6)

Introduction, Construction and working of transistor, Input-output and transfer characteristics of CE & CB mode, Relation between α and β . Transistor as amplifier - CE mode, Problems.

Reference books:

- 1) Principles of electronics–V.K. Mehta
- 2) Electronics principles-Malvino
- 3) Basic electronics & linear circuits-Bhargav, Kulshrtha & Gupta
- 4) Electricity and Magnetism–Khare & Shrivastav
- 5) Foundations of electromagnetic theory-Reitz & Milford
- 6) Electronic devices & circuits-Allen Mottershed

Learning Outcomes: On successful completion of this course students

1. Understand the concept of Varying Current and applying them in charging and discharging of capacitor and time constant.
2. Understand the concept of AC circuits and different AC bridges.
3. Understand the concepts Magnetostatics and applying them to determine magnetic induction and also understand Ballistic Galvanometer theory and its constants.
4. Understand the rectifiers specially Bridge rectifier with filters also different wave shaping circuits.
5. Understand BJT include its output characteristics under CE and CB mode with application of transistor amplifier.

PHYSICS PRACTICAL OF CORE DSC 1A & DSC 1B: OF 04 CREDITS

(Total Credits: 4, Contact hrs: 4 hrs per week)

Marks: 100 (UA-80 + CA-20)

Group I – General Physics and Heat

1. L C of various measuring instruments and instrumental zero errors of each Instrument and its correction for more accuracy in the measurements.
2. Bar pendulum
3. Bifilar pendulum
4. Torsional pendulum
5. Moment of Inertia of disc by annular ring
6. Poisson's ratio
7. Surface Tension by liquid drop method
8. Viscosity of water by Poiseuille's method
9. Viscosity by Stoke's method
10. Frequency of AC mains by magnetic and nonmagnetic wire
11. Temperature coefficient of resistance of Copper wire

Group II – Electricity, Electronics, and Optics

1. Use of Spectrometer to determine Angle of prism
2. Dispersive power of prism
3. Diffraction grating to determine its grating element
4. To determine wavelength of LASER beam by using diffraction grating/
Divergence of LASER beam

5. Newton's ring (to determine Wavelength and Radius of curvature of Plano-convex lens)
6. Photo cell (verification of inverse square law)
7. Bridge rectifier and π filter - β & γ
8. Out Put Characteristics Transistor amplifier in CE mode: determination of β)
9. Zener diode as a voltage regulator (Plot voltage resistance graph as well as Knee Characteristic curve I – V and comments)
10. Liquid lens to determine the refractive index of any liquid
11. Colour code of resistors and measurement of capacitors; identification of their values.

Reference Books:-

- 1) Advanced Practical physics –Nelkon
- 2) Practical physics - Rajopadhye and Purohit
- 3) Practical Physics – P R Sasi Kumar