

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 (Semester –I and II)

(Syllabus to be implemented from w.e.f. June 2019)

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Choice Based Credit System (CBCS) Pattern Syllabus

B.Sc. Part I Physics (w. e. f. June 2019)

- i) There will be two theory papers of 50 (80 % UA & 20 % CA) marks for each semester. Practical examination at the end of second semester will be of 100 (80 % UA & 20 % CA)marks. Total marks for physics subject will be 300 (80 % UA & 20 % CA) and $5 + 5 + 4 = 14$ Credits.
- ii) There shall be 2.5 periods (2.5 Credits) per paper i.e. 5 periods per week for theory and 4 periods (4 Credits) per week for each batch of 20 students for practical.
- iii) The duration of theory examination for each paper will be 2 hours each and that for practical will be 6 Hours. There will be two sessions for annual practical examination morning and evening each of 3 hours.
- iv) Examination of Physics theory Paper-I & II will be held at the end of first Semester.
- v) Examination of Physics theory Paper-III & IV will be held at the end of second Semester.
- vi) Practical examination of both semesters will be held at the end of semester II. Every student will have to perform two experiments (one experiment from each Group).

Semester – I

(Theory Course: DSC 1A)

Titles of theory papers

Core Subject DSC 1A: Physics Paper I – Mechanics and properties of matter.

50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

Core Subject DSC 1A: Physics Paper II – Optics and Laser.

50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

Semester – II (Theory Course: DSC 1B)

Titles of theory papers

Core Subject DSC 1B: Physics Paper III – Heat and Thermodynamics.

50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

Core Subject DSC 1B Physics Paper IV –

Electricity, Magnetism and Basic Electronics.

50 (80 % UA and 20 % CA) Marks and (2.5 Credits)

Practical Course of Semester – I & II (Practical Course examination of Core DSC 1A & 1B at the end of second semester)

Titles of Practical Groups

Core Subject Practical (DSC 1A): Group I – General Physics and Heat

50 (40 UA and 10 CA) Marks and (2 Credits)

Core Subject Practical (DSC 1B) Group II – Electricity, electronics, and optics

50 (40 UA and 10 CA) Marks and (2 Credits)

ANNUAL PRACTICAL EXAMINATION AT THE END OF 2nd SEMESTER
OF 100 Marks (UA – 80 Marks + CA – 20 Marks)

Group (I & II) experiments UA $(35 * 2) + CA (10 * 2) = 70 + 20 = 90$ Marks

Scale down of 35 Marks for UA per Group: As per given in the practical slips. 10 marks for certified Journal.

Scale down of 20 Marks for CA: - Internal examination of $(35*2 = 70)$ Marks reduced to 20 marks)

10 Marks for certified journal should not be given in case of loss certificate. Student may appear practical examination for $35+35=70$ marks with prior permission of his/her Principal. External Examiner will allow him/her only after submission of permission letter of his/her Head of Physics Department / Principal.

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

• Faculty of Science •

(w. e. f. June 2019)

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

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.

CORE PAPER (DSC 1A): PHYSICS PAPER - I

Title: - Mechanics and Properties of Matter.

Topic 1 – Moment of Inertia **09**
Review of M.I., Moment of Inertia of 1) Circular disc 2) Rectangular lamina 3) Spherical Shell 4) Fly wheel.

Topic 2 – Pendulums **10**
Introduction, Theory of compound pendulum, Bar pendulum, Kater's Pendulum, Bessel's Theory, Bifilar pendulum (parallel suspensions of equal lengths), Torsional Pendulum.

Topic 3 – Elasticity **07**
Introduction, Equivalence of shear strain to compression and extension strains, Relation between elastic constants, Poisson's ratio of rubber tube (Theory and experimental method)

Topic 4 – Surface Tension **08**
Review of S.T., 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.

Topic 5 – Viscosity and Fluid dynamics **08**
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.

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

CORE PAPER (DSC 1A): PHYSICS PAPER - II

Title: - Optics and Laser

Topic 1 – Geometrical Optics and aberrations 10

Introduction, Fermat's principle, Deduction of laws of reflection and refraction by Fermat's principle, Chromatic and Spherical aberration, methods to minimize Chromatic and Spherical aberrations.

Topic 2 – Optical Instruments 08

Introduction, Types of eye-pieces, Gauss eye piece, Ramsden's eye-piece, Huygen's eye-piece, Construction, working and Application of Spectrometer and Optical bench.

Topic 3 – Interference 08

Introduction, Interference in parallel faced thin film (Reflected light only), wedge shaped film, Newton's rings and its applications.

Topic 4 – Diffraction 08

Introduction, Types of diffraction, Plane diffraction grating and its elementary theory, its application to determine wavelength, Comparison between prism and grating spectra

Topic 5 – Laser 08

Introduction, Spontaneous and Stimulated emission and absorption, Einstein's Coefficients, Population inversion, Optical Pumping, Cavity resonator, He-Ne and Ruby Laser, Properties and application.

Reference books:-

1. Ray Optics by R K Verma.
- 2..Text Book of Optics (new edition) – Brijlal and Subramanyam
3. Optics(second edition) – Ajay Ghatak
4. Concept of Physics – H C Verma
5. Laser and Optics – B. B. Loud
6. Optics by Mathur

CORE PAPER (DSC 1B): PHYSICS PAPER - III

Title: - Heat and Thermodynamics

Topic 1 –Transport Phenomenon

08

Introduction, mean free path, Claussius expression for mean free path (Collision cross section),Transport Phenomenon, Coefficient of Viscosity, Thermal Conductivity and its dependence on temperature and pressure

Topic 2 - Liquefaction of Gases

08

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

Topic 3 – Thermodynamics

10

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

Topic 4 – Heat engines

08

Introduction:, Carnot's heat engine and its efficiency; Heat engine, Otto cycle and its efficiency Diesel cycle and its efficiency, comparison between Otto and diesel engine.

Topic 5 –Refrigerator

08

General principle, Refrigeration Cycle, coefficient of performance of refrigerator, Vapor compression Refrigerator, Air conditioning (principle and applications)

Reference books:-

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

CORE PAPER(DSC 1B): PHYSICS PAPER – IV

Title: - Electricity, Magnetism and Basic Electronics

Topic 1 – Varying Current: 08

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

Topic 2 – A.C. Circuits: 08

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, AC bridge (Owen's bridge).

Topic 3 – Magnetostatics and Ballistic Galvanometer: 08

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 B G.

Topic 4 – Electronic circuit components and Devices: 09

Classification of electronic circuit components as passive and active (Resistor, Capacitor, Inductor, Transformer, Switches, Relays, Diodes, Transistor, FET, SCR, UJT and IC) with their symbol and specification. Bridge rectifier with Pie-Filter, Clippers, Clampers, Zener diode and its application as a voltage regulator.

Topic 5 – Bi-Junction Transistor (BJT): 09

Construction and working of transistor, input-output and transfer characteristics of CE & CB mode, Relation between α and β . Transistor as amplifier (CE mode)

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

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

Group I – General Physics and Heat (DSC 1A)

1. Bar pendulum
2. Bifilar's pendulum
3. Torsional pendulum
4. Moment of Inertia of disc by annular ring
5. Poisson's ratio
6. Surface Tension by liquid drop method
7. Thermal conductivity of insulator by Lee's 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
12. L C of various measuring instruments (V C, M S G, Spherometer, Travelling Microscope, Galvanometer, Voltmeter, Ammeter, Spectrometer, Monometer, Optical Bench); Instrumental zero errors of each instrument and its correction for more accuracy in the measurements. .

Group II – Electricity, electronics, and optics (DSC 1B)

1. Use of Spectrometer to determine Angle of prism
2. Dispersive power of prism
3. Diffraction grating to determine its grating element
4. LASER (to determine its wavelength of LASER beam by using diffraction grating)
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. Impedance of LCR series circuit.
12. Classification of electronic circuit components: (resistors, capacitors, inductors, Diodes, transistors, field effect transistors, silicon controlled rectifiers, potentiometers, rheostats, thermistors, thermocouples, Integrated Circuits, Relays); Colour code of resistors and capacitors; identification of their values.

NB: Ten experiments from each group must be completed to certify the Journal.

Reference Books:-

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