

SOLAPUR UNIVERSITY, SOLAPUR

New Semester Pattern

Credit Based Grade System Syllabus

B.Sc. Part I Physics (w. e. f. June 2014)

N. B.:-

i) There will be single theory paper of 70 marks for each semester (Section I and Section II of 35 Marks each) Annual practical of 70 marks at the end of second semester.

The total marks for physics subject will be 300 (70 % University Assessment & 30 % College Assessment). There will 5 Credits for theory and 4 Credits for Practical.

ii) There shall be 2.5 periods per section i.e. 5 periods per week for theory and 4 periods per week for each practical batch of 20 students.

iii) The duration of theory examination paper will be 3 hours each and that for practical will be 2 sessions of 3 hours each.

iv) 30 % internal College Assessment and 70 % University Assessment for both T & P.

v) University will conduct practical examination of 70 marks at the end of semester II.

Every student will have to perform two experiments (one from each Group).

vi) All Colleges will conduct the internal assessment of theory (30 Mark) in both semesters and Practical (30 Mark) at the end of second semester by their convenience and only marks will be sent to the University before the start of University examinations.

Semester-I

Physics Paper – I (Mechanics, Properties of Matter and Optics)

Section: - I Mechanics and properties of matter 50 Marks

Section: - II Optics and Laser 50 Marks

Semester-II

Physics Paper – II (Heat, Thermodynamics, Electricity, Magnetism and Basic Electronics)

Section: - I Heat and Thermodynamics 50 Marks

Section: - II Electricity, Magnetism and Basic Electronics 50 Marks

Practical at the end of Second Semester 100 Marks

Physics Paper I

Section I - Mechanics and Properties of Matter.

Topic 1 – Moment of Inertia **06**

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 and S. Kumar.
- 3) Physics Volume I – David & Robert Resnick.
- 4) University Physics-Mechanics of a particle - Anvar Kamal.

Physics Paper I

Section – II (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

Physics Paper II

Section - I (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 liqefier; cooling by adiabatic demagnetization and expression for fall in temperature, experimental setup for adiabatic demagnetisation 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

Physics Paper II

Section - II (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 LR and CR circuit

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-Savart's law and 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, working Principle and its constants.

Topic 4 – Electronic circuit components and Devices: 09

Classification of electronic circuit components: Passive and active circuit component (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: 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, Kulshrstha &Gupta
4) Electricity and Magnetism – Khare & Shrivastav
5) Foundations of electromagnetic theory- Reitz & Milford
6) Electronic devices & circuits-Allen Mottershed

Practical (4 Credits) – 100 Marks (30 % internal + 70 % University)

Group I – General Physics, Heat

1. Bar pendulum to determine acceleration due to gravity.
2. Bifilar's pendulum to determine acceleration due to gravity.
3. Torsional pendulum to determine rigidity of modulus of a given metal wire.
4. Moment of Inertia of a disc by annular ring method.
5. Poisson's ratio of rubber tube.
6. Surface Tension of any liquid by drop method.
7. Thermal conductivity of any insulator by Lee's method..
8. Viscosity of water by Poiseuille's modified method.
9. Viscosity any liquid by Stoke's method.
10. Frequency of AC mains by Sonometer using magnetic and nonmagnetic wire

Group II – Electricity, electronics, and optics

1. Use of Spectrometer to determine Angle of prism.
2. Use of Spectrometer to determine Dispersive Power of Prism.
3. Diffraction grating to determine its grating element and wavelength of sodium source.
4. LASER (to determine its wavelength 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 $I \propto 1/d^2$).
7. Bridge rectifier with π filter - (Voltage regulation percentage β and Ripple factor γ)
8. Transistor Characteristics in CE mode (Output impedance Z_{out} and amplification factor β)
9. Zener diode as a voltage regulator.
10. Temperature coefficient of resistance of a Copper wire.

NB:

Any 8 experiments from each group are required to certify the Journal. 05 Marks for certified journal. Marks of Journal should not be given to the student if He/She fails to produce the certified journal at the time of examination. Student may allow appearing for practical examination only after the submission of permission letter from his/her Principal.

Reference Books: - 1) Advanced Practical physics –Nelkon
2) Practical physics - Rajopadhye and Purohit

