

SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part II

**Subject:- Physics (Semester pattern Syllabus)
w.e.f. June 2011**

Semester III

Physics Paper V (General Physics and Sound)

1. **Gravitation :**
Constant of gravitation G , Determination of G by Cavendish's method, correction and sources of errors in the method, Determination of mass of sun, variation of acceleration due to Earth's gravity (g) with altitude and depth in the earth's crust . (06)
2. **Precessional motion :**
Graphical representation of plane vectors, precession, nutation, Gyroscope, Gyrostatic pendulum, Motion of rolling disc and hoop, Gyroscopic applications - Gyrocompass, Riding on a bicycle, refilling of barrels of guns and rifles. (08)
3. **Elasticity :**
Bending moment, Cantilever, Centrally loaded beam, Flat spiral spring-expression for Y and η . (10)
4. **Viscosity :**
Viscosity of liquid by rotating cylinder method, Searle's viscometer, viscosity of gases by Rankine's method (without derivation) (05)
5. **Sound :**
Musical sound and Noise, Characteristics of musical sound Loudness, pitch and quality, Bel, Decibel and Phon, Measurement of intensity of sound by Rayleigh's method, Limits of audibility of human ear. Transducers and their characteristics, Microphone, Loud speakers (08)
6. **Acoustics of Buildings :**
Factors affecting acoustics of buildings, reverberation time, Sabine's experimental work and formula, Optimum reverberation time, requirements of good acoustics. (05)

REFERANCE BOOKS

1. General properties of matter - J.C.Upadhyaya.
2. Physics vol. I - Halliday and Resnick.
3. Elements of properties of matter - D.S. Mathur
4. Text book of sound - Brijlal and Subramanyam.
5. Sound - Khanna and Bedi.
6. Sound - Wood A.B.

Semester III

Physics Paper VI Optics

1. Cardinal points :

Largrange's and Helmholtz laws, Abbe's sign condition, Cardinal points of an optical system, Graphical construction of image using cardinal points, Newton's formula, Relation between focal lengths for any optical system, Relation between lateral, axial and angular magnifications. Thick lens in air, Combination of two thin lenses, General combination of two optical systems, Deviation method for locating cardinal points. (10)

2. Interference of Light :

Michelson's interferometer and its applications to measure
i) Wavelength of light, ii) Difference in wave lengths and iii) Refractive index of thin film. Construction and working of Fabry- Perot interferometer, Superiority of F.P. interferometer over Michelson's interferometer. (07)

3. Diffraction of light :

Fresnel's Half period zones, Explanation of rectilinear propagation of light, Zone plate, Fresnel's diffraction at straight edge and circular aperture. (06)

4. Resolving Power :

Geometrical and spectral resolution, Distinction between magnification and resolution, Rayleigh's criterion for the limit of resolution, Modified Rayleigh's criterion, R.P. of plane diffraction grating, R.P. of prism. (05)

5. Polarisation :

Double refraction, Huygen's explanation of double refraction through uniaxial crystals, Nicol prism, Phase retardation plates, Elliptically and circularly polarized light, Detection of plane, elliptically and circularly polarized light, Optical rotation, laws of rotation of plane of polarization, origin of optical activity, Fresnel's explanation of optical activity, Polarimeter. (08)

6. Lasers :

Spontaneous and stimulated emission, absorption, Einstein coefficients, Population inversion, optical and electrical pumping, Cavity resonators, Properties of Lasers, Ruby Laser, He-Ne Laser, uses of Lasers, Holography and its applications. (06)

REFERENCE BOOKS

1. Geometrical and physical optics - D.S. Mathur
2. Text book of optics (new edition) - Brijlal and Subramanyam.
3. Fundamental of optics - Jenkins and White.
4. Optics (second edition) - Ajay Ghatak.
5. Optics and atomic physics - Satya Prakash.
6. LASER and nonlinear optics - B.B. Laud.

Semester IV Physics Paper VII - Electronics

1. Review of Bi-Junction Transistors :

Silicon NPN and PNP transistors, I_c versus V_{be} , I_c versus I_b , I_c versus V_{ce} characteristics with magnitude, cut-in, cut-off, active, saturation, locus of $V_{ce} = V_{ce} + I_c \times R_c$ on output characteristics i.e loadline. (08)

2. Transistor amplifier :

Transistor biasing : voltage divider bias, single stage common emitter transistor amplifier, D.C. and A.C. equivalent circuits, D.C. and A.C. load lines, frequency response curve of an amplifier, negative and positive feedback, effect of negative feedback on the frequency response curve. (06)

3. Oscillator :

Types of waveforms, oscillations from tank circuit, Barkhausen's criterion for sustained oscillations, phase shift oscillator, Colpitt's oscillator, Hartley oscillator, crystal oscillator (qualitative treatment only). (08)

4. FET and UJT :

FET: Construction, operation and characteristics, application of FET as VVR.
UJT: Construction, operation and characteristics, UJT as voltage sweep generator. (10)

5. Digital Electronics :

De Morgan's theorems, NAND as universal gate, construction of other gates from NAND gate, half adder and full adder using gates, construction and working of RS and JK flip flops. (06)

6. Cathode ray oscilloscope :

Principle, construction and working of CRT, block diagram of CRO, uses of CRO. (04)

REFERANCE BOOKS

1. Principles of electronics - V.K. Mehta.
2. Electronics principles - (3rd edition) - Malvino.
3. Digital principles and application (4th edition) - Malvino and Leach.

Semester IV Physics Paper – VIII Modern Physics

1. Theory of Relativity :

Inertial frame of reference, Galilean transformation, invariance of laws of mechanics under Galilean transformation, ether hypothesis, Michelson Morley experiment, Postulates of the special theory of relativity, Lorentz transformation, length contraction, time dilatation, velocity addition theorem, variation of mass with velocity, mass energy equivalence, twin paradox.

(12)

2. Matter Waves :

De Broglie's hypothesis of matter waves, De Broglie's wavelength, Particle velocity, Group velocity, Phase velocity and their inter-relationship, properties of matter waves, Bohr's quantum condition and matter wave hypothesis.

(06)

3. Compton effect :

Compton effect, Expression for change in wavelength for scattered photon, Experimental verification.

(06)

4. X rays :

Production of X-rays, continuous & characteristic X-ray spectrum, Bragg's Law, Bragg's Spectrometer, Intensity of X-rays, Mosley's Law.

(04)

5. Vector atom model :

Space quantization, electron spin hypothesis, Stern Gerlach experiment, quantum numbers, Pauli's exclusion principle, spin orbit coupling, Hund's rule, total angular momentum, LS and JJ coupling, effect of magnetic field on atom, normal & anomalous Zeeman effect, explanation of normal Zeeman effect using magnetic quantum number.

(12)

6. Radioactivity :

Half life, Mean life, successive radioactive transformation ABC type, radioactive equilibrium (transient & secular), carbon dating.

(04)

REFERANCE BOOKS

1. Introduction to special relativity by Robert Resnik.
2. Perspective of modern Physics - Arthur Beiser.
3. Atomic and nuclear Physics - Gupta and Ghosh, 2nd Edition.
4. Quantum Mechanics - Singh, Bagade, Kamal Singh, Chand and Co.
5. Introduction to Atomic and Nuclear Physics - H. Semat and Albrought.
6. Atomic Physics - Rajam.

B.Sc. Part II (List of Physics experiments)
(w.ef. June 2011)

Group I (General Physics and Sound)

1. Young's Modulus by bending.
2. Y and n by Searle's method.
3. Modulus of rigidity by torsional oscillations.
4. S.T. of liquid by drop weight method.
5. S.T. by Torsion balance method.
6. Viscosity of liquid by Searle's viscometer.
7. Velocity of sound in air by Kundt's tube and A.F. Oscillator.
8. Velocity of sound in air by Resonating bottle.

Group II (Optics)

1. Biprism.
2. Goniometer.
3. Determination of Cauchy's Constants.
4. R.P. of Grating.
5. Diffraction at single slit.
6. Double refracting prism.
7. Polarimeter.
8. Wavelength measurement of LASER by diffraction grating.

Group III (Electronics)

1. Series voltage regulator.
2. Baising network.
3. C.R.O. sensitivity and measurement of unknown frequency.
4. Characteristics of FET.
5. UJT as voltage sweep generator.
6. Colpitt's oscillator.
7. Phase shift oscillator.
8. De Morgan's theorems.

Group IV (Electricity)

1. Constants of B.G.
2. Comparison of Capacities by De Sauty's method.
3. Mutual inductance by B.G. Method.
4. Carey Foster Bridge-measurement of low resistance.
5. Calibration of Bridge wire by Griffirh's method.
6. High resistance by equal deflection method.
7. Characteristics of Photovoltaic cell.
8. Impedance of LCR Circuit.

Note : Study tour is compulsory for B.Sc. Part II Physics students.

NATURE OF THEORY QUESTION PAPER FOR SEMESTER PATTERN**Time: - 2 hrs****Total marks : -50****Q.No.1) Multiple choice questions. (10)**

- 1) -----
a)b).....c).....d).....
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)

Q.No.2) Answer any five of the following (10)

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

Q.No.3) A) Answer any two of the following (06)

- 1)
- 2)
- 3)

B Write the answer/solve/problem/note (04)**Q.No.4) Answer any two of the following (10)**

- 1)
- 2)
- 3)

Q.No.5) Answer any one of the following (10)

- 1)
- 2)

NB:

- 1) There will be four theory papers, each of 50 marks. (Paper V & VI for semester III and Paper VII & VIII for semester IV). Annual practical will be for 100 marks. Total marks for physics will be 300 (200 marks for theory and 100 marks for practical).
- 2) There shall be three periods per paper that is six periods per week for theory and eight periods per week per practical batch of 16 (Sixteen) students each.
- 3) Duration of theory examination for each paper will be 2 hours each and that for the practical will be 12 hours i.e 4 sessions of practical examination each of 3 hours.
- 4) The theory examination of paper V and VI will be held at the end of semester III
- 5) The theory examination of paper VII and VIII will be held at end of semester IV
- 6) The practical examination of the both terms will be held at the end of semester IV. Every student will have to perform four experiments i.e one each from the group I,II,III and IV respectively.