SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part – II

Subject : Physics (Semester Pattern syllabus)

w.e.f. june 2014

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 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 means 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.

Titles

Semester – III

Paper – V	**General Physics, Heat and Sound**	**50 Marks**
Paper –VI	**Electronics**	**50 Marks**

Semester – IV

Paper – VII	**Optics**	**50 Marks**
Paper – VIII	**Modern Physics**	**50 Marks**
Annual Practical at the end of Fourth semester		**100 Marks**

[Four groups each of 20 marks, 10 Marks for Journal and 10 Marks for Theoretical Project (on Scientist, inventions and instruments)]

At least seven experiments from each group are required to certify the journal. 10Marks for certified journal and 10 Marks for project should not be given in case of lost certificate. Students may appear the practical examination of 80 marks with prior permission of his/her Principal. Examiner and Lab Sup will allow him / her only after submission of permission letter.

Semester III

Physics Paper V (General Physics, Heat and Sound)

1. Vectors: [08]

1.1 Scalar and vector triple product
1.2 Scalar and vector fields
1.3 Del operator
1.4 Gradient of a scalar
1.5 Divergence of a vector, curl of vector and their physical significance

2. Precessional Motion: [08]

2.1 Precession
2.2 Nutation
2.3 Gyroscope
2.4 Lanchester's rules
2.5 Gyrostatic pendulum
2.6 Motion of rolling disc
2.7 Gyroscopic applications in brief

3. Elasticity: [08]

3.1 Bending of a beam
3.2 Bending moment
3.3 Cantilever
3.4 Centrally loaded beam
3.5 Flat spiral spring expression for Y and η

4. Viscosity: [05]

4.1 Viscosity of liquid by rotating cylinder method
4.2 Searle's viscometer
4.3 Ostwald's viscometer

5. Heat: [06]

5.1 Entropy
5.2 Change in entropy
5.3 Physical concept and physical significance of entropy
5.4 T – S diagram
5.5 Entropy of a perfect gas
5.6 Entropy of a steam

6. Sound: [10]

6.1 Transducer
6.2 Pressure microphone

6.3 Moving coil Loudspeaker
6.4 Acoustics and its affecting factors
6.5 Reverberation time
6.6 Optimum reverberation time
6.7 Requirement of good acoustics
6.8 Sabine's formula
6.9 Ultrasonic production by piezoelectric method
6.10 Detection of ultrasonic
6.11 Properties and Applications of ultrasonic

Reference Books:

1. Elements of matter – D.S. Mathur
2. Physics for degree students – C. L. Arora, P. S. Hemne.
3. Text book of properties o matter – N. S. Khare , S. K. Kumar
4. Text book of Sound – Brijlal and Subramanyam.
5. Sound – Khanna and Bedi
6. Sound – Wood A. B.
7. Heat, Thermodynamics and Statistical Physics – Brijlal & Subramanyam S Chand Publicaton
8. Mathematical Physics – Rajput & Gupta
9. Engineering Physics Part I – Selladurai PHI Learning Pvt. Ltd, New Delhi

Semester III

Physics Paper VI (Electronics)

1. Transistor amplifier : [10]

1.1 Transistor biasing: voltage divider bias
1.2 Two stage R-C coupled transistor amplifier
1.3 Frequency response curve of an amplifier
1.4 Feedback
1.5 Effect of negative feedback on the frequency response curve
1.6 Differential amplifier
1.7 Modes of operation
1.8 Common mode and differential mode signals
1.9 Comparison between normal amplifier and differential amplifier

2. Oscillator : [8]

2.1 Types of waveforms
2.2 Oscillations from tank circuit
2.3 Barkhausen's criterion for sustained oscillations
2.4 Concept of AF and RF Oscillator
2.5 Phase shift oscillator
2.6 Colpitt's oscillator
2.7 Hartley oscillator,
2.8 Crystal Oscillator (qualitative treatment only)

3. Unipolar Devices: [07]

3.1 FET: Construction, operation and characteristics
3.2 Application of FET as VVR
3.3 UJT: Construction, operation and characteristics
3.4 UJT as voltage sweep generator

4. Digital Electronics : [06]

4.1 De Morgan's theorems
4.2 Half adder
4.3 Full adder
4.4 Construction and working of RS flip flop
4.5 Construction and working of JK flip flop

5. **Regulated power supply** [07]

5.1 Regulated power supply (with block diagram) and its need
5.2 Line and load regulation
5.3 Transistor Series power supply
5.4 IC voltage regulators
5.5 Fixed output voltage regulators (using IC 78XX and 79XX)
5.6 Dual power supply using 3 pin IC

6. Electronic Instrument : [07]

6.1 Principle, Construction and working of CRT

6.2 Block diagram of CRO

6.3 Uses of CRO

6.4 Block diagram of digital multimeter (DMM) and its applications

REFERANCE BOOKS:

1. Principles of electronics - V.K. Mehta
2. Electronics principles - (3rd and 6th edition) - Malvino.
3. Digital principles and application (4th edition) - Malvino and Leach.
4. Op-Amps and linear integrated circuits(4th edition)- Ramakant Gayakwad.
5. A Text book of Electrical Technology Vol. IV – B. L. Theraja, A.K. Theraja

Semester IV

Physics Paper VII (Optics)

1. Cardinal points: **[8]**

1.1 Lagrange's equation
1.2 Cardinal points of optical system
1.3 Graphical construction of image using cardinal points
1.4 Newton's formula
1.5 Relation between focal lengths for any optical system
1.6 Relation between lateral, axial and angular magnifications
1.7 Thick lens (introduction)
1.8 combination of two thin lenses

2. Interference of light: **[7]**

2.1 Michelson's interferometer
2.2 Applications of Michelson's interferometer to measure i) wavelength of light ii) Difference in wavelengths and iii) Refractive index of thin film
2.3 Construction and working of Fabry Perot interferometer
2.4 Superiority of F.P. interferometer over Michelson's interferometer

3. Diffraction of light: **[7]**

3.1 Fresnel's Half period zones
3.2 Explanation of rectilinear propagation of light
3.3 Zone plate
3.4 Fresnel's diffraction at straight edge

4. Resolving power: **[7]**

4.1 Geometrical and spectral resolution
4.2 Distinction between magnification and resolution
4.3 Rayleigh's criterion for the limit of resolution
4.4 Modified Rayliegh's criterion
4.5 R.P. of plane diffraction grating
4.6 R.P. of prism

5. Polarization: **[10]**

5.1 Double refraction
5.2 Huygen's explanation of double refraction through uni-axial crystals
5.3 Nicol prism
5.4 Phase retardation plates
5.5 Elliptically and circularly polarized light
5.6 Optical rotation
5.7 Laws of rotation of plane of polarization
5.8 Applications a) Polarimeter b) Liquid crystal Displays (LCDs)

6. Optical Fibers: **[6]**

6.1 Structure and types of fibers
6.2 Numerical aperture (definition only)
6.3 Pulse dispersion in step index fiber
6.4 Fiber optic communication system (Qualitative treatment only)
6.5 Advantages of optical fiber

Reference Books:

1. Optics and Spectroscopy – R. Murigation
2. Text book of optics (new edition) – Brijlal and Subramanyam
3. Optics (Second edition) – Ajay Ghatak
4. Geometrical and Physical optics – D. S. Mathur
5. Fundamental of optics – Jenkins and white
6. Optics and Atomic physics – Satya Prakash
7. Engineering Physics – S. Selladurai
8. Optical Communication - Jain Mathur (Kanpur IIT)

Semester IV

Physics Paper VIII (Modern physics)

1. Theory of relativity: **[13]**

1.1 Inertial frame of reference
1.2 Galilean transformation
1.3 Invariance of laws of mechanics under Galilean transformation
1.4 Ether hypothesis
1.5 Michelson-Morley experiment
1.6 Einstein's postulates of the special theory of relativity
1.7 Lorentz transformation
1.8 Variation of length with velocity
1.9 Variation of time with velocity
1.10 Velocity addition theorem
1.11 Variation of mass with velocity
1.12 Mass energy relation
1.13 Twin paradox

2. Matter waves: **[7]**

2.1 De Broglie's hypothesis of matter waves
2.2 De Broglie's wavelength
2.3 Particle velocity, group velocity , phase velocity & their interrelationship
2.4 Properties of matter waves
2.5 Bohr's quantum condition on the basis of matter wave hypothesis
2.6 Heisenberg's uncertainty principle

3. Vector Atom model: **[13]**

3.1 Space quantization
3.2 Spin hypothesis
3.3 Stern-Gerlache experiment
3.4 Quantum numbers associated with vector atom model
3.5 Pauli's exclusion principle
3.6 Spin orbit coupling
3.7 Hundt's rule
3.8 Total angular momentum
3.9 L-S coupling
3.10 J-J coupling
3.11 Zeeman effect
3.12 Normal and anomalous Zeeman effect
3.13 Debye's explanation of normal Zeeman effect

4. **Compton effect:** **[05]**
   4.1 Compton Effect
   4.2 Expression for change in wavelength for scattered photon
   4.3 Experimental verification of Compton effect

5. **Nuclear Energy sources:** **[07]**
   5.1 Neutron induced nuclear reaction
   5.2 Nuclear fission
   5.3 Energy released in fission
   5.4 Chain reaction (Atomic Bomb)
   5.5 Nuclear reactor
   5.6 Atomic energy in India

Reference Books:

1. Introduction to special relativity by Robert Reshnik
2. Perspective of Modern Physics – Arther 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
7. Modern Physics – S. H. Patil (IIT)
8. Nuclear Physics -Kaplan

B.Sc. II (List of Physics Experiments)
(w.e.f. 2014)

Group I (General Physics, Heat and Sound)

1. Young's Modulus (Y) by bending.
2. Y or η by Searle's method.
3. Young's modulus (Y) by Vibration of a bar.
4. Kater's Pendulum.
5. Surface tension by Quinke's method.
6. Viscosity of liquid by Searl's method.
7. J by Electrical method.
8. Thermal conductivity of rubber tube.
9. Velocity of sound by Kundt's tube
10. Velocity of sound by resonating bottle.

Group II (Electronics)

1. Transistor series voltage regulator.
2. Biasing 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.
9. Two stage RC coupled amplifier
10. Construction of half adder & full adder using gates

Group III (Optics)

1. Biprism: To determine the wavelength of monochromatic light
2. Goniometer: Equivalent focal length
3. Goniometer: Cardinal points
4. Determination of Cauchy's Constants
5. Double refracting prism
6. Optical activity of sugar solution (Polarimeter)
7. Diffraction at single slit
8. Resolving power of grating
9. Diffraction at straight edge
10. Wedge shaped film: Measurement of thickness

Group IV (Electricity, Magnetism and Modern Physics):

1. Constants of B.G.
2. Comparison of Capacities
3. Mutual Induction of two coils
4. Low resistance by Carry fosters method
5. High resistance by nearly equal deflection method
6. Solae cell characteristics to determine fill factor and efficiency
7. Impedance of LCR circuit
8. Sharpness of series resonance in circuit
9. Study of Characteristics of G M tube and determination of its operating voltage, platue length slope etc
10. Verification of inverse square law for gamma rays

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)

N.B.:

1. Two numerical based sub-questions must be asked in question number one.
2. One mathematical example of 2 marks must be asked in question number two.
3. One mathematical example of 3 marks must be asked in question number 3A.
4. One mathematical example of 5 marks may be asked in question number four.
5. Example of 3 marks may add in fifth broad answer type question if derivation is asked.
6. Weightage for each topic must be given as per period allotted to complete the topic.