SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part – II

Subject: Physics (New CGPA Pattern syllabus)

With effect from - June 2015

NB:

1. There will be four theory papers, each of 100 marks. (Paper III & IV for semester III and Paper V & VI for semester IV). Annual practical will be for 200 marks. Total marks for physics will be 600 (400 marks for theory and 200 marks for practical). Assessment system for both theory and practical will be 70 % UA and 30 % CA.

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 of 70 marks will be 3 hours each and that for the practical examination will be 12 hours means 4 sessions of 3 hours each.

4. The theory examination of paper III and IV will be held at the end of semester III.

5. The theory examination of paper V and VI 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. any one from each group.

7. Report of 30 % CA of both theory & practical has to submit in the University by the Colleges before announcement of University examination.

Titles

Semester – III

Paper – III	**General Physics, Heat and Sound**	**100 (70 % UA + 30 % CA) Marks**
Paper –IV	**Electronics**	**100 (70 % UA + 30 % CA) Marks**

Semester – IV

Paper – V	**Optics**	**100 (70 % UA + 30 % CA) Marks**
Paper – VI	**Modern Physics**	**100 (70 % UA + 30 % CA) Marks**

Annual Practical at the end of Fourth semester   **200 (70 % UA + 30 % CA) Marks**

[UA(University Assessment): Four groups each of 30 marks and 20 Marks for Journal;   CA(College Assessment): 60 Marks]

Semester III

Physics Paper III - 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 Requirements 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 of 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 IV - 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 Instruments: [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 V - 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 Rayleigh's criterion
    4.5R.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 Nicols 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 VI - 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 and its illustrations

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 Hund'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 - 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 Physics Practical (List of Physics Experiments)

(With effect from - June 2015)

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 Searle'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. Use of C.R.O. for measurement of AC, DC voltage and 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 for different thick lenses.
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. Solar cell characteristics to determine fill factor and efficiency
7. Impedance of LCR series circuit
8. Sharpness of series resonance 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

NB: At least seven experiments from each group are required to certify the journal. 20 Marks for certified journal should not be given in case of lost certificate. Such students may appear the practical examination of 140 marks with prior permission of his/her Principal. Examiner and Laboratory Supervisor will allow him / her only after submission of permission letter and lost certificate from his / her Principal.

NATURE OF THEORY QUESTION PAPER FOR NEW SEMESTER & CGPA PATTERN
(With effect from June – 2015)

Time: - 3 hrs   **Total marks: -70**

Q.No.1) Choose and write a correct answer from given four alternatives.   **(10)**
      1) --
           a)…………….b)…………….c)………………..d)……………
      2)
      3)
      4)
      5)
      6)
      7)
      8)
      9)
      10)

Q.No.2) Solve any five of the following   **(15)**
      1)
      2)
      3)
      4)
      5)
      6)

Q.No.3) A) Solve any three of the following   **(15)**
      1)
      2)
      3)
      4)

Q.No.4) Solve any three of the following   **(15)**
      1)
      2)
      3)
      4)

Q.No.5) A) Answer any one of the following long answer questions   **(10)**
       1)
       2)
    B) Solve any one problem   **(05)**
       1)
       2)

Instructions to be strictly followed by paper setters: -
1. Two numerical based sub-questions must be asked in question number one.
2. One mathematical example of 3 marks must be asked in question number two.
3. One mathematical example of 5 marks must be asked in both question number 3 & 4.
4. Weightage for each topic must be given as per periods allotted to complete the topic.