

**PUNYASHLOK AHILYADEVJI HOLKAR
SOLAPUR UNIVERSITY, SOLAPUR**



NAAC Accredited-2015

'B' Grade (CGPA 2.62)

Name of the Faculty: Science & Technology

CHOICE BASED CREDIT SYSTEM

Syllabus: PHYSICS

Name of the Course: B.Sc. II (Sem-III & IV)

(Syllabus to be implemented from w.e.f. June 2020)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

B.Sc. Part – II

Core Subject: - Physics

(New CBCS Semester Pattern) syllabus w e f June 2020)

1. There will be four theory papers (Paper V and Paper VI for semester III and Paper VII and Paper VIII for semester IV) of 50 marks and 2 credits each. Annual practical examination will be of 100 marks and 4 credits. Total marks for physics as a core subject will be 300 [200 marks (8 credits) for theory and 100 marks (4 credits) for practical). Assessment system for both theory and practical will be of 80 % UA (University Assessment) and 20 % CA (College Assessment).
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 40 marks will be 2 hours each and that for the practical examination will be two days means 4 sessions of 3 hours each.
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 semester 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 20 % CA (5 Marks for internal examination and 5 Marks for assignment of each paper of every semester) of theory and practical (5 Marks for each group at the end of second term of B Sc Part II before commencement of University examination of fourth semester) has to submit by the College in the University office.

Titles of Physics as a core subject with their paper codes

Semester – III

Paper – V - General Physics and Sound. - 50 (80 % UA + 20 % CA) Marks

Paper –VI - Electronics - 50 (80 % UA + 20 % CA) Marks

Semester – IV

Paper – VII - Optics - 50 (80 % UA + 20 % CA) Marks

Paper – VIII - Modern Physics - 50 (80 % UA + 20 % CA) Marks

Annual Practical at the end of Fourth semester 100 (80 % UA + 20 % CA) Marks

[UA (University Assessment): Four groups each of 15 marks, 10 Marks for Journal, 10 Marks for educanctional trip / industrial visit/ seminar or conference attendance/ project report; CA (College Assessment): 20 Marks]

Equivalent Subject for Old Syllabus

Sr. No.	Name of the Old Paper	Name of the New Paper
1)	Paper: V General Physics, Heat and Sound	Paper: V General Physics and Sound
2)	Paper: VI Electronics	Paper: VI Electronics
3)	Paper: VII Optics	Paper: VII Optics
4)	Paper: VIII Modern Physics	Paper: VIII Modern Physics

Semester III

Physics Paper V - General Physics and Sound

(50 Marks and 2 Credits)

- 1. Vectors:** [6 hr]
 - 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 and their physical significance
 - 1.6 curl of vector and their physical significance

- 2. Precessional Motion: -** [6 hr]
 - 2.1 Precession
 - 2.2 Gyroscope
 - 2.3 Nutation
 - 2.4 Lanchester's rules
 - 2.5 Gyrostatic pendulum
 - 2.6 Motion of rolling disc
 - 2.7 Gyroscopic applications in brief

- 3. Elasticity: -** [6 hr]
 - 3.1 Bending of a beam
 - 3.2 Bending moment
 - 3.3 Cantilever
 - 3.4 Centrally loaded beam
 - 3.5 Y and η by Searle's method

- 4. Viscosity: -** [6 hr]
 - 4.1 Motion in a viscous medium- Stoke's law
 - 4.2 Viscosity of liquid by rotating cylinder method
 - 4.3 Searle's viscometer
 - 4.4 Ostwald's viscometer
 - 4.5 Viscosity of gasses – Rankin's mehod

5. Sound:

[6 hr]

5.1 Acoustic transducers i) Pressure microphone ii) Moving coil loudspeaker

5.2 Acoustics and its affecting factors

5.3 Reverberation time and its optimum value

5.4 Requirements of good acoustics

5.5 Sabine's formula

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. Mathematical Physics – Rajput & Gupta
8. Engineering Physics Part I – Selladurai PHI Learning Pvt. Ltd, New Delhi

Semester III

Physics Paper VI - Electronics - (50 Marks and 2 Credits)

1. Transistor amplifier : [8 hr]

- 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 positive and 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 : [6hr]

- 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: [4 hr]

- 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. Electronic Instruments: [6 hr]

- 4.1 Principle, Construction and working of CRT
- 4.2 Block diagram of CRO
- 4.3 Uses of CRO
- 4.4 Digital Multimeter (DMM) and its applications

5 . Regulated power supply [6hr]

- 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

REFERANCE BOOKS:

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

Semester IV

Physics Paper VII - Optics - (50 Marks and 2 Credits)

- 1. Cardinal points:** [6hr]
- 1.1 Lagrange's equation
 - 1.2 Cardinal points of optical system
 - 1.3 Graphical construction of image using cardinal points & Newton's formula
 - 1.4 Relation between focal lengths for any optical system
 - 1.5 Relations between lateral, axial and angular magnifications
 - 1.6 Thick lens (introduction)
 - 1.7 combination of two thin lenses
- 2. Interference of light:** [6hr]
- 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 An Etalon (Introduction Only)
 - 2.4 Construction and working of Fabry Perot interferometer
 - 2.5 Superiority of F.P. interferometer over Michelson's interferometer
- 3. Diffraction of light & resolving power:** [7hr]
- 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
 - 3.5 Geometrical and spectral resolution
 - 3.6 Distinction between magnification and resolution
 - 3.7 Rayleigh's criterion for the limit of resolution and modified Rayleigh's criteria
 - 3.8 Modified Rayleigh's criterion
 - 3.9 R.P. of plane diffraction grating
 - 4.0 R. P. of prism
- 4 Polarization:** [7hr]
- 4.1 Concept of Polarization
 - 4.2 Double refraction and
 - 4.3 Huygen's explanation of double refraction through uni-axial crystals
 - 4.4 Nicol's prism

- 4.4 optical rotation
- 4.5 Optical Activity and Specific Rotation
- 4.6 Laws of rotation and plane of polarization
- 4.7 Polaroid and their Use to Polarization
- 4.8 Applications
 - a) Polarimeter
 - b) Liquid crystal Displays (LCDs)

5. Optical Fibers:

[4hr]

- 5.1 Structure of fibers
- 5.2 Types of optical fiber
- 5.3 Numerical aperture
- 5.4 Pulse dispersion in step index fiber
- 5.5 Fiber optic communication system
- 5.6 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 - (50 Marks and 2 Credits)

1. Theory of relativity: [9 hr]

- 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: [6 hr]

- 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: [8 hr]

- 3.1 Space quantization
- 3.2 Spin hypothesis
- 3.3 Stern-Gerlach 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: **[3 hr]**

- 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: **[4 hr]**

- 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
(100 Marks and 4 Credits)**

(With effect from - June 2020)

List of Experiments

Group I (General Physics, Heat and Sound)

1. Young's Modulus (Y) by bending of the centrally loaded beam.
2. Y or η of the material in the form of wire 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. Surface Tension of liquid by capillary rise 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 due to cylindrical obstacle.
10. Wedge shaped film: Measurement of thickness

Group IV (Electricity, Magnetism and Modern Physics):

1. Constants of B.G.
2. Comparison of Capacities by Deshott's method.
3. Mutual Induction of two separate coils or transformer coils (Primary & Secondary)
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 parallel circuit at resonating state
8. Sharpness of series resonance circuit
9. Study of Characteristics of G M tube and determination of its operating voltage, Plate length and slope etc
10. Verification of inverse square law for gamma rays

NB: At least eight experiments from each group are required to certify the journal. 10 Marks for certified journal should not be given in case of lost certificate & 10 Marks for educational trip / industrial visit/ seminar or conference attendance/ project report. Such students may appear the practical examination of 80 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.

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

• Faculty of Science •

(w. e. f. June 2020)

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 Write notes on any Two of the following

(08)

i

ii)

iii)

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 3 and 4 must be of numerical type sub question.