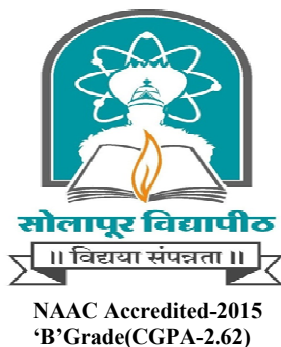


# **Solapur University, Solapur**



## **B.Sc. Part- II Physics**

### **Semester III and IV**

### **Choice Based Credit System**

### **(CBCS) Pattern**

## **SYLLABUS**

**w.e.f. A.Y 2017-18**

## Structure for B. Sc-II

Subject/ Core Course	Name and Type of the Paper		No. of theory Papers / Practicals	Hrs / week			Total Marks Per Paper	UA	CA	Credits
	Type	Name		L	T	P				
<b>Class :</b>	<b>B Sc Part - II Semester - III</b>									
	Core	PHYSICS 1	Physics Paper V	3	--	--	100	70	30	3
			Physics Paper VI	3	--	--	100	70	30	3
	Core	Subject 2	Paper V	3	--	--	100	70	30	3
			Paper VI	3	--	--	100	70	30	3
	Core	Subject 3	Paper V	3	--	--	100	70	30	3
			Paper VI	3	--	--	100	70	30	3
<b>Grand Total</b>				<b>18</b>	--	--	<b>600</b>	<b>420</b>	<b>180</b>	<b>18</b>
<b>Class :</b>	<b>B Sc Part - II Semester - IV</b>									
	AEEC	Environmental Science		4			100	70	30	4
	Core	PHYSICS 1	Physics Paper VII	3	--	--	100	70	30	3
			Physics Paper VIII	3	--	--	100	70	30	3
	Core	Subject 2	Paper VII	3	--	--	100	70	30	3
			Paper VIII	3	--	--	100	70	30	3
	Core	Subject 3	Paper VII	3	--	--	100	70	30	3
		Paper VIII	3	--	--	100	70	30	3	
<b>Total (Theory)</b>				<b>22</b>	--	--	<b>700</b>	<b>490</b>	<b>210</b>	<b>22</b>
	Core	PHYSICS 1	Physics Pr. II&III	--	--	8	200	140	60	8
	Core	Subject 2	Pr. II&III	--	--	8	200	140	60	8
	Core	Subject 3	Pr. II&III	--	--	8	200	140	60	8
<b>Total (Practicals)</b>						<b>24</b>	<b>600</b>	<b>420</b>	<b>180</b>	<b>24</b>
<b>Grand Total</b>				<b>22</b>		<b>24</b>	<b>1300</b>	<b>910</b>	<b>390</b>	<b>46</b>

- Several initiatives have been taken by Solapur University Solapur time to time to upgrade and enhance the academic excellence, examination reforms and developing the skilled minds and skilled hands. The CGPA pattern has been adopted in academic year 2014-15. Now the university is going one step ahead to adopt and implement the Choice Based Credit System (CBCS) semester pattern to both PG and UG. As per initiatives led by University the syllabus of B. Sc. I Physics (CBCS) semester pattern has been finalized and effectively implemented from academic year 2016-17. From this academic year 2017-18 we are implementing B. Sc. II Physics (CBCS) semester pattern effectively.
- The main objective is to create skilled minds and therefore understanding of mathematical knowledge essential for finding solution of various interesting physical phenomenon. It helps in general to improve scientific attitude to solve the research oriented problems of interesting systems

# SOLAPUR UNIVERSITY, SOLAPUR

## B.Sc. Part – II

### Core Subject: - Physics

#### (New CBCS Semester Pattern) syllabus w e f June 2017

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 100 marks and 3 credits each. Annual practical examination will be of 200 marks and 8 credits. Total marks for physics as a core subject will be 600 [400 marks (12 credits) for theory and 200 marks (8 credits) for practical). Assessment system for both theory and practical will be of 70 % UA (University Assessment) and 30 % 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 70 marks will be 2.5 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 VII 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 30 % CA (15 Marks for internal examination and 15 Marks for assignment of each paper of every semester) of theory and practical (15 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 (Phy235) - General Physics, Heat and Sound. - 100 (70 % UA + 30 % CA) Marks

Paper –VI (Phy236) - Electronics - 100 (70 % UA + 30 % CA) Marks

##### **Semester – IV**

Paper – VII (Phy247) - Optics - 100 (70 % UA + 30 % CA) Marks

Paper – VIII (Phy248) - 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): 15 \* 4 = 60 Marks]

# Semester III

## Physics Paper V (Phy235) - General Physics, Heat and Sound

(100 Marks and 3 Credits)

- 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  $\eta$
  
- 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 VI (Phy236) - Electronics - (100 Marks and 3 Credits)

- 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 6<sup>th</sup> 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 (Phy247) - Optics - (100 Marks and 3 Credits)

- 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
  - 4.5 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 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 VIII (Phy248) - Modern physics - (100 Marks and 3 Credits)

### 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-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:** [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 Resnik
2. Perspective of Modern Physics – Arther Beiser
3. Atomic and nuclear Physics – Gupta and Ghosh 2<sup>nd</sup> 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**

## **(200 Marks and 8 Credits)**

### **(With effect from - June 2017)**

## **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  $\eta$  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 Deshoty'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 series circuit
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. 20 Marks for certified journal should not be given in case of lost certificate. Such students may appear the practical examination of 120 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 CBCS SEMESTER PATTERN  
(With effect from June – 2017)**

Time: - 2 hrs 30 min.

Total marks: -70

**Q.No.1 Choose and write a correct answer from given four alternatives. (14)**

1) -----  
a).....b).....c).....d).....

- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)
- 9)
- 10)
- 11)
- 12)
- 13)
- 14)

**Q.No.2 Answer any seven of the following (14)**

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)
- 7)
- 8)

**Q.No.3 A) Attempt any two of the following (10)**

- 1)
- 2)
- 3)

**B) Solve an example / short answer question (04)**

**Q.No.4 Solve any two of the following (14)**

- 1)
- 2)
- 3)

**Q.No.5 Answer any one of the following long answer questions (10)**

- 1) Long answer question / question of derivation (10)  
Example on the above long answer question (04)
- 2) Long answer question / question of derivation (10)  
Example on the above long answer question (04)

**NB: The following instructions should be strictly followed by the paper setters.**

- 1. Two numerical based sub-questions must be asked in question number one.
- 2. At least one mathematical example of 2 marks must be asked in question number two.
- 3. One mathematical example of 5 marks must be asked in both question number 3A.
- 4. One mathematical example of 7 marks may be asked in question number 4.
- 5. Weightage for each topic in the question must be given as per periods allotted in syllabus to complete the topic.