

## PHYSICS COMPLEMENTARY COURSE STRUCTURE

Total Credits: 12 (Internal: 20%; External: 80%)

<i>Semester</i>	<i>Code No</i>	<i>Course Title</i>	<i>Hours/Week</i>	<i>Total Hours</i>	<i>Credit</i>	<i>Marks</i>
1	PHY1C01	Complementary Course I: Properties of matter and Thermodynamics	2	36	2	75
	-	Complementary Course V: PHYSICS Practical	2	36	-*	-
2	PHY2C02	Complementary Course II: Optics ,Laser, Electronics	2	36	2	75
	-	Complementary Course V: PHYSICS Practical	2	36	-*	-
3	PHY3C03	Complementary Course III: Mechanics, Relativity, Waves and Oscillations	3	54	2	75
	-	Complementary Course V: PHYSICS Practical	2	36	-*	-
4	PHY4C04	Complementary Course IV: Electricity ,Magnetism and Nuclear Physics	3	54	2	75
	PHY4C05	Complementary Course V: PHYSICS Practical	2	36	4*	100
<b>Total</b>					<b>12</b>	<b>400</b>

\* Examination will be held at the end of 4<sup>th</sup> semester

### COMPLEMENTARY COURSE THEORY: EVALUATION SCHEME

The evaluation scheme for each course contains two parts: *viz.*, internal evaluation and external evaluation. Maximum marks from each unit are prescribed in the syllabus.

#### 1. INTERNAL EVALUATION

20% of the total marks in each course are for internal evaluation. The colleges shall send only the marks obtained for internal examination to the university.

**Table 1: Components of Evaluation**

<i>Sl. No.</i>	<i>Components</i>	<i>Marks for 2/3 credits papers</i>
1	Class room participation based on attendance	3
2	Test paper: I	6
3	Assignment	3
4	Seminar/ Viva	3
<i>Total Marks</i>		15

**Table 2: Pattern of Test Papers**

<i>Duration</i>	<i>Pattern</i>	<i>Total number of questions</i>	<i>Number of questions to be answered</i>	<i>Marks for each question</i>	<i>Marks</i>
2 Hours	Short answer	12	10-12	2	20
	Paragraph/problem	7	6-7	5	30
	Essay	2	1	10	10
<i>Total Marks*</i>					60

\*90% and above = 6, 80 to below 90% = 5.5, 70 to below 80% = 5, 60 to below 70% = 4.5, 50 to below 60% = 4, 40 to below 50% = 3.5, 35 to below 40% = 3, 25 to below 30% = 2.5, 15 to below 20 = 2, less than 15 = 0

## **2. EXTERNAL EVALUATION**

External evaluation carries 80% marks. University examinations will be conducted at the end of each semester.

**Table 1: Pattern of Question Papers**

<i>Duration</i>	<i>Pattern</i>	<i>Total number of questions</i>	<i>Number of questions to be answered</i>	<i>Marks for each question</i>	<i>Marks</i>
2 Hours	Short answer	12	10-12	2	20
	Paragraph/problem	7	6-7	5	30
	Essay	2	1	10	10
<i>Total Marks</i>					60

### Practical Evaluation (Complementary)

Internal		External	
Record	4	Record with 20 experimrnts. Max. ½ mark for one expt.	10
Regularity	4	Formulae, Theory, Principle	22
Attendance	4	Adjustments, setting	14
Test I	4	Tabulation & Observation	20
Test II	4	Calculation, graph, result, unit	10
		Viva	4
<b>Total</b>	<b>20</b>	<b>Total</b>	<b>80</b>

**B.Sc. PHYSICS**  
**COMPLEMENTARY COURSES SYLLABUS**  
**(For B. Sc Programme in Mathematics, Chemistry etc)**

**Semester 1 | Complementary course-I**  
**PHY1C01: Properties of matter & Thermodynamics**  
**36 Hours (Credit - 2)**

	<b>Course Outcome</b>	<b>CL</b>	<b>KC</b>	<b>Class Sessions allotted</b>
<b>CO1</b>	Understand the basic principles of elasticity	U	C	9
<b>CO2</b>	Understand the concepts of surface tension	U	C	5
<b>CO3</b>	Understand the aspects of viscosity	U	C	4
<b>CO4</b>	Understand the basic principles of thermodynamics	U	C	18

**Unit 1 Elasticity.**

**9 Hrs**

Elastic moduli. (Elementary ideas)- Work done per unit volume - Poisson's ratio and theoretical limits - relation between various elastic constants(Derivation not required)- Twisting couple on a cylinder(Derivation not required)- Torsion pendulum-Determination of rigidity modulus of a wire- Bending of beams-bending moment- I-form girders- Cantilever loaded at the free end – Loaded uniformly (Derivation required )

**Unit 2 Surface Tension & Viscosity.**

**9 Hrs**

Surface tension (Elementary ideas)-Excess pressure inside a liquid drop and bubble (Effect of electrostatic pressure on a bubble-change in radius)-Work done in blowing the bubble ( problem based on the formation of bigger drop by a number of smaller drops )

Viscosity-Coefficient of viscosity-Derivation of poiseuille's equation, stokes equation- Determination of viscosity by Poiseuille's method and stokes method-Brownian motion – Viscosity of gases

**Unit 3 Thermodynamics**

**18 Hrs**

Thermodynamic processes –Indicator diagram ( P-V diagram, P-T diagram, T-V diagram, T-S diagram )- Work done in Quasi static process-Work done in Isothermal, Adiabatic, Isochoric, Isobaric processes-First law of thermodynamics-Application to heat capacities- Second law of thermodynamics- Carnot's engine - Derivation of efficiency using Carnot's cycle-Carnot's theorem and its proof- Carnot's refrigerator( coefficient of performance )-

**Entropy**- Change of entropy in a Carnot's cycle, reversible cycle, irreversible cycle, principle of increase of entropy- Entropy and available energy- entropy and disorder - Clausius-Clapeyron equation (Derivation not required)-Effect of pressure on melting point and boiling point.

**Text for study**

1. Properties of matter-D. S. Mathur
2. Properties of matter-JC Upadhyaya
3. Heat and Thermodynamics- Brijlal and Subrahmanyam

**Books for reference**

1. Heat and Thermodynamics- D S Mathur
2. Heat and Thermodynamics - Zemansky
3. Physics- Resnick and Halliday
4. Thermodynamics- Brijlal and Subrahmanyam

**Mark distribution for setting Question paper.**

Unit/ chapter	Title	Marks
1	Elasticity	20
2	Surface Tension & Viscosity	20
3	Thermodynamics	39
<i>Total Marks *</i>		79

\*Total marks include that for choice of questions in sections A, B and C in the question paper.

## LAB PROGRAMME FOR COMPLEMENTARY COURSES

(Lab examination will be conducted at the end of 4<sup>th</sup> semester)

The minimum number of experiments for appearing examination is **75% of total 24 experiments** in the syllabus. Basic theory of the experiment must be shown at the time of Examination. **Students must submit a certified fair record at the time of Examination.** Number of Questions per session for the practical Examination shall be 8, and a minimum of 6 questions in the Question paper shall be set for the Examination at the centre.

### Semester 1 to 4 | Complementary Course V

#### PHY4C05: PHYSICS PRACTICALS I

36 Hours in each semester × 4 (Credit - 5)

	Course Outcome	CL	KC	Class Sessions allotted
CO1	Apply and illustrate the concepts of properties of matter through experiments	Ap	P	36
CO2	Apply and illustrate the concepts of electricity and magnetism through experiments	Ap	P	36
CO3	Apply and illustrate the concepts of optics through experiments	Ap	P	36
CO4	Apply and illustrate the principles of electronics through experiments	Ap	P	36

#### List of Experiments

1. Characteristics of Diode and Zener diode
2. Liquid lens- Refractive index of liquid and glass
3. Torsion pendulum- Rigidity modulus
4. Spectrometer- Refractive index of the material of prism
5. Deflection Magnetometer- Moment of a magnet (Tan-A & Tan - B positions)
6. Potentiometer-Measurement of resistance
7. Young's modulus – Uniform bending –using optic lever
8. Static torsion – Rigidity modulus
9. Spectrometer- Grating- Normal incidence
10. Melde's string- Frequency of fork (Transverse and Longitudinal mode)- (Mass determination by equal oscillation method / digital balance)

11. Half wave rectifier and Full wave rectifier
12. Field along the axis of a circular coil
13. Deflection Magnetometer- Moment of a magnet (Tan-C)
14. Potentiometer- Conversion of Galvanometer in to voltmeter –calibration by standard voltmeter
15. Viscosity of liquid- Capillary flow- Variable pressure head method (Mass determination by equal oscillation method / digital balance)
16. Logic gates – Verification of truth table
17. Carey Fosters bridge- Resistivity of the material of wire
18. Surface Tension-Capillary rise method - Radius by microscope.
19. Young's modulus of a cantilever- Pin and microscope method
20. Potentiometer-Calibration of low range voltmeter
21. Moment of inertia of fly wheel
22. Tangent galvanometer – Reduction factor
23. Searle's vibration magneto meter – Comparison of moments
24. Newton's rings- Wavelength of sodium light

**Books of Study:**

1. Electronics lab manual- K A Navas (vol 1 &2)
2. B.Sc Practical Physics- C L Arora

**Reference book:**

3. Practical Physics- S L Gupta & V Kumar