

**SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED**

**B.Sc. I Year Physics Syllabus**

**(Revised Syllabus Effective from June 2009)**

<b>Course Title</b>	<b>Semester</b>	<b>Periods</b>	<b>Marks</b>	
			<b>Ext</b>	<b>Int</b>
<b>PHY111: Mechanics Oscillations and Kinetic Theory (Paper-I)</b>	<b>1</b>	<b>40</b>	<b>50</b>	<b>10</b>
<b>PHY121: Properties of Matter and Thermodynamics (Paper-III)</b>	<b>2</b>	<b>40</b>	<b>50</b>	<b>10</b>
<b>PHY 112: Mathematical Physics, Electricity and Magnetism (Paper-II)</b>	<b>1</b>	<b>40</b>	<b>50</b>	<b>10</b>
<b>PHY 122: Modern physics and Basic Electronics (Paper-IV)</b>	<b>2</b>	<b>40</b>	<b>50</b>	<b>10</b>
<b>PHY 103: Practical Course (Paper-V)</b>	<b>1 and 2</b>	<b>80</b>	<b>100</b>	<b>20</b>

**PHY 111: Mechanics, Oscillations and Kinetic Theory**

**Paper-I**

**Periods: 40**

**Marks: 50 Ext. + 10 Internal**

**Units-I: Mechanics**

**(10 Periods)**

Compound Pendulum, Interchangeability of centers of suspension and Oscillations, Kater's reversible Pendulum, Kepler's laws of Planetary Motion Gravitational Field, Gravitational Intensity, Gravitational Potential, Gravitational Potential and Intensity due to uniform Solid Sphere (Point inside and outside).

**Unit-II: Oscillations**

**(10 Periods)**

Free Vibrations, Undamped Vibrations, Damped Vibrations, Damped SHM in an Electrical Circuit, Forced Vibrations, Resonance and Sharpness of Resonance, Phase of Resonance, Quality factor, Examples of Forced and Resonant Vibrations.

**Unit-III: Kinetic Theory of Heat**

**(10 Periods)**

Andrew's Experiment, Amagat's Experiment, Vander wall's Equation of State, Critical Constants, Porous Plug Experiment, Reduced Equation of State, Boyle's temperature.

**Unit-IV: Transport Phenomena**

**(10 Periods)**

Mean free path, Transport Phenomena, Viscosity of Gases, Thermal Conductivity of Gases, Diffusion, Inter relation between three transport coefficients

**Books Recommended:**

1. Elements of Properties of Matter – D.S.Mathur, Shamlal Charitable trust, New Delhi
2. General Properties of Matter – J.C.Upadhyaya, Ram Prasad & Sons, Agra
3. Waves and Oscillations – Brijlal and Subrahmanyam. (Vikas Publishing House)
4. Heat and Thermodynamics – D.S.Mathur, Sultan Chand & Sons, New Delhi
5. Heat and Thermodynamics – Brij Lal, N.Subrahmanyam, Sultan Chand & Company Ltd.
6. Thermodynamics, Kinetic Theory, and Statistical Thermodynamics – Sears and Salinger, Narosa Publishing House, New Delhi
7. Thermodynamics and Statistical Physics – S.L.Kakani

**PHY 121: Properties of Matter and Thermodynamics**

**Paper-III**

**Periods: 40**

**Marks: 50 Ext. + 10 Internal**

**Units-I: Elasticity**

**(10 Periods)**

Twisting couple on a cylinder (wire), Torsional pendulum, Determination of coefficient of Rigidity ( $\eta$ ) for a Wire by Horizontal torsion apparatus, Bending of Beams, Bending Moment, Cantilever (Weight of the beam is ineffective, Weight of the beam is effective), Depression of a Beam loaded at the centre, Determination of 'Y' by Bending of a Beam.

**Unit-II: Surface Tension and Viscosity**

**(10 Periods)**

Expression for Excess Pressure on a Curved Surface, Excess Pressure inside a Liquid Drop and a Soap Bubble, Surface Tension by Jaeger's Method, Poiseuille's Method for the Determination of Coefficient of Viscosity, Searle's Viscometer, Variation of Viscosity with temperature

**Unit-III: Thermodynamics**

**(10 Periods)**

Zeroth Law of Thermodynamics, First Law of Thermodynamics, Relation connecting P, V and T in an Adiabatic Process, Second Law of Thermodynamics (Kelvin and Clausius statements), Carnot's cycle, Carnot's Engine and its efficiency, Carnot's Theorem, Entropy changes of a Closed System during an Irreversible Process, Entropy, Third Law of Thermodynamics.

**Unit-IV: Thermodynamic Relations**

**(10 Periods)**

Maxwell's Thermodynamical Relations, T- ds equations, Clausius-Clapeyron latent heat equations, Internal energy, Helmholtz' function, Enthalpy, Gibb's function

**Books Recommended:**

1. Elements of Properties of Matter – D.S.Mathur, Shamlal Charitable trust, New Delhi.
2. General Properties of Matter – J.C.Upadhyaya, Ram Prasad & Sons, Agra.
3. Heat and Thermodynamics – D.S.Mathur, Sultan Chand & Sons, New Delhi.
4. Heat and Thermodynamics – Brij Lal, N.Subrahmanyam, Sultan Chand & Company Ltd. Ram Nagar, New Delhi.
5. Thermodynamics and Statistical Physics – S.L.Kakani

**PHY 112: Mathematical Physics, Electricity and Magnetism** **Paper-II**

**Periods: 40**

**Marks: 50 Ext. +10 Internal**

**Unit-I: Mathematical Background (12 Periods)**

Vector triple product, Gradient of a scalar field, Divergence and Curl of a vector field (Physical interpretation of grad, div, curl), Line integral, Surface integral, Volume integral, Flux of vector field, Gauss's divergence theorem, Stoke's theorem, Green's theorem (Statements only) **Proof of the following vector identities:**

1)  $\nabla \times \nabla \phi = 0$

2)  $\nabla \cdot (\nabla \times \mathbf{A}) = 0$

3)  $\nabla \cdot (\phi \mathbf{A}) = \phi (\nabla \cdot \mathbf{A}) + \mathbf{A} \cdot (\nabla \phi)$

4)  $\nabla \times (\phi \mathbf{A}) = \phi (\nabla \times \mathbf{A}) + (\nabla \phi) \times \mathbf{A}$

**Unit-II: Current Electricity (12 Periods)**

Kirchhoff's Laws, Thevenin's Theorem, Norton's Theorem, Maximum Power transfer Theorem, Rise and decay of current in L-R and C-R circuits, decay constants.

**Unit- III: Ballistic Galvanometer (8 Periods)**

Moving coil type Ballistic Galvanometer, logarithmic decrement, damping correction, charge sensitivity.

**Unit- IV: Electromagnetic Induction (8 Periods)**

Self induction, Mutual induction, Transformer: Principle, Relation between turns ratio with current and voltage ratios; Efficiency of transformer, Losses in transformer, Types of transformer.

**Books Recommended:**

1. Vector Analysis - Murray R. Spigel
2. Mathematical Physics - B.S. Rajput
3. Foundations of Electromagnetic theory- Reitz, Milford, Christey
4. Introduction to Electrodynamics – D.G. Griffith
5. Electricity and Magnetism - Brij Lal, Subramanyan (Ratan Prakashan Mandir, Twentieth revised and enlarged edition 1997)
6. Electricity and Magnetism – Khare, Shrivastav ( Twentieth revised 1997)
7. Electronic Devices and Circuits – Allan Mottershed.
8. Electricity and Electronics – D.C. Tayal (Himalaya Publishing House, Mumbai)
9. Radio Engineering – M. L. Gupta

**PHY 122: Electromagnetics and Basic Electronics**

**Paper-IV**

**Periods: 40**

**Marks: 50 Ext. +10 Internal**

**Unit-I: Magnetostatics**

**(10 Periods)**

Definition of Magnetic Induction, Forces on current carrying conductors, Biot and Savart's law and its application to the long straight conductor and circular coil.

**Unit-II: Maxwell's equations**

**(10 Periods)**

Maxwell's equations and their derivations. Electromagnetic Energy, Wave equations for electric (**E**) and magnetic (**H**) field

**Unit-III: Diode Circuits**

**(8 Periods)**

Bridge rectifier,  $\pi$ -filter, Clippers and Clampers, Photo diode and its V-I characteristics.

**Unit-IV: Transistors and Oscillators**

**(12 Periods)**

Configuration of transistor, Transistor characteristics in CE, CB and CC mode, Transistor as an amplifier in CE mode, Comparative study of CE, CB and CC configurations. Positive feedback amplifier-Oscillator, Essentials of transistor Oscillator, Barkhausen Criterion.

**Books Recommended:**

1. Foundations of Electromagnetic theory- Reitz, Milford, Christey (3<sup>rd</sup> Edition)
2. Introduction to Electrodynamics – D.G. Griffith (PHI)
3. Principles of Electronics – V.K. Mehta
4. Basic Electronics – B.L. Thereja
5. Electricity and Electronics – D.C. Tayal (Himalaya Publishing House, Mumbai)

**PHY 103: Practical Course**

***Paper-V***

***Periods: 80***

***Marks: 60***

**List of Experiments**

1. Bifilar suspension.(Determination of M.I. and verification of perpendicular axis theorem)
2. Y- by Spiral spring.
3.  $\eta$  - by Spiral spring.
4.  $\eta$  - by Static torsion.
5.  $\eta$  - by Maxwell's needle.
6. Y- by bending loaded at the middle.
7. Viscosity of given liquid by Poiseuille's method.
8. Surface Tension of liquid by Jaeger's method.
9. Calibration of capillary tube.
10. Helmholtz resonator
11. Thermal conductivity by Lee's disc method
12.  $\mu$ - of prism by Spectrometer (Focussing by distant object method)
13.  $\mu$ - of prism by Spectrometer (Focussing by Schuster's method).
14. Calibration of Spectrometer.
15. Field along the axis of Circular coil (Determination of radius of the coil)
16. Ballistic galvanometer (Figure of merit)
17.  $C_1/C_2$  by proportional kick method.
18. Characteristics of semiconductor diode
19. Zener diode as voltage regulator
20. Output characteristics of transistor- CE mode

**Note:** Each student appearing for examination must produce a journal showing that he has completed not less than **16** experiments during the year.