

SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED

B.Sc. II Year Physics Syllabus

(Revised Syllabus Effective from June 2009)

Title	Paper	Periods	Marks
Electrodynamics, Relativity, Nuclear Physics and Statistical physics	IV	80	100
Oscillations, Optics and Lasers	V	80	100
Physics Practical	VI	80	100
Physics Practical	VII	80	100

B.Sc. II Year

PHYSICS PAPER – IV

(Electrodynamics, Relativity, Nuclear Physics and Statistical physics)

Marks: 100

Periods: 80

Unit I: Mathematical Background

(24 Periods) (20 Marks)

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, Gauss's divergence theorem, Stoke's theorem, Green's theorem (Statements only), Curvilinear co-ordinate system (expressions for gradient, divergence and curl). Spherical polar co-ordinate system. **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: Electrostatics:

(24 Periods) (20 Marks)

Polarization, field outside a dielectric media, Gauss's law in a dielectric-the electric displacement, Electric susceptibility and dielectric constant, Clausius-Mossotti equation, Induced dipoles. Applications of Biot and Savart's law for long straight conductor and circular coil

Maxwell's equations

Generalization of Ampere's law-displacement current, Maxwell's equations and their derivations. Electromagnetic Energy, Wave equations for electric (**E**) and magnetic (**H**) field

Unit III: Relativity

(12 Periods) (20 Marks)

Postulates of special theory of relativity, Gallilian transformations, Lorentz transformations, Lorentz-Fitzgerald contraction, Time dilation, mass energy relation.

Unit IV: Nuclear physics

(10 Periods) (20 Marks)

Binding energy, Semi empirical formula for B.E., Nuclear reaction, kinematics and Q-value, Geiger Muller counter, Cloud chamber, Ionization chamber.

Unit V: Statistical Physics

(10 Periods) (20 Marks)

Maxwell-Boltzmann statistics and distribution law, Bose- Einstein statistics and distribution law, Fermi- Dirac statistics and distribution law.

Books Recommended:

1. Vector Analysis - Murray R. Spiegel
2. Mathematical Physics - B.S. Rajput
3. Foundations of Electromagnetic theory- Reitz,Milford,Christey
4. Introduction to Electrodynamics – D.G. Griffith
5. Perspectives of Modern physics – Arthur Beiser
6. Relativistic mechanics – Satya Prakash
7. Nuclear Physics – D.C.Tayal
8. Nuclear Physics – Irving Kaplan
9. Heat and Thermodynamics - Brijlal and Subrahmanyam
10. Thermodynamics and Statistical Physics – S.L.Kakani

B.Sc. II Year

PHYSICS PAPER – V

(Oscillations, Optics and Lasers)

Marks: 100

Periods: 80

Unit I: Oscillations

(12 Periods) (20 Marks)

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 II: Geometrical Optics

(12 Periods) (20 Marks)

Cardinal Points of an Optical System(six points), Newton's formula, Nodal slide, Coaxial Lens System (equivalent focal length and cardinal points), Huygens Eyepiece, Ramsden Eyepiece and their cardinal points.

Unit III:**Interference**

(26 Periods) (30 Marks)

Interference due to Reflected and Transmitted light (Thin films), Newton's Rings, Determination of wavelength of Sodium light, Michelson Interferometer,

Determination of wavelength of monochromatic light, Difference in wavelength between two neighbouring spectral lines.

Diffraction

Fresnel and Fraunhofer diffraction, Fraunhofer's diffraction due to single and double slit, Plane diffraction grating, Determination of wavelength of Sodium light, Rayleigh criterion, Resolving power of grating, Resolving power of Prism.

Unit IV: Polarization

(20 Periods) (20 Marks)

Polarization by Reflection, Brewster's law, Malus law, Double refraction, Nicol prism, Nicol prism as an analyzer, Huygen's explanation of double Refraction in Uniaxial crystals, Optic axis in the plane and inclined to the crystal surface, Elliptically and Circularly polarized light, Quarter wave plate, Half wave plate, Optical Activity, Specific rotation, Laurent's half shade polarimeter.

Unit V: Laser system

(10 Periods) (10 Marks)

Spontaneous & stimulated emission, absorption, Einstein coefficients (definitions), Population inversion, Optical & electrical pumping, Cavity resonators, Properties of lasers, Ruby laser, Helium-Neon laser, Applications of lasers.

Books Recommended:

1. Waves and Oscillations – Brijlal and Subrahmanyam. (Vikas Publishing House)
2. Text Book of Sound - Khanna and Bedi.
3. A Text Book of Optics - Brijlal and Subrahmanyam. (S.Chand & Co.)
4. Lasers and Nonlinear Optics – B.B.Laud (W.Eastern limited)
5. Optics and Atomic Physics – D.P. Khandelwal.(Himalaya Publishing House)
6. Optics (Second edition) – A.K.Ghatak

Physics Practical

Paper-VI

Marks:100

1. Moment of Inertia of a flywheel
2. Kater's pendulum
3. γ by Cantilever (Oscillation method)
4. η by torsional pendulum
5. γ and η by Searle's method
6. Coefficient of viscosity by Searle's viscometer
7. Surface tension by Fergusson method
8. Frequency of A.C. by Sonometer
9. Determination of ' μ ' by i - δ curve using spectrometer
10. Determination of λ of Sodium light by Newton's ring
11. Diffraction grating minimum deviation
12. Diffraction grating normal incidence
13. λ by Biprism
14. λ by Lloyd's single mirror
15. Resolving power of Telescope
16. Resolving power of grating
17. Thermal conductivity by Searle's method
18. Specific rotation by Laurent's half shade polarimeter

Physics Practical

Paper-VII

Marks:100

1. I-H curve by magnetometer method
2. Potentiometer- measurement of Low resistance
3. Measurement of E.M.F. by thermocouple
4. Temperature coefficient of resistance using Carry Foster bridge
5. High resistance by leakage of condenser-using B.G.
6. C_1/C_2 by Desauty's method
7. C_1/C_2 by Method of mixture

8. Maximum velocity of electron using photocell
9. h/e by Photocell
10. Solar cell characteristics
11. LDR-LED characteristics
12. Photodiode characteristics
13. Transistor characteristics (C-B mode)
14. Transistor characteristics (C-E mode)
15. Characteristics of photo transistor
16. Verification of Thevinin's theorem
17. Verification of Norton's theorem
18. Absolute capacity of a condenser.