

**GUJARAT UNIVERSITY**  
**Syllabus for First Year B. Sc.: Semester - I**  
**PHYSICS : PHY-101**

**Unit – I : Vector Analysis:**

Introduction, Applications of Vector Multiplication, Triple Scalar Product, Triple Vector Product, Differentiation of Vectors, Fields, Directional Derivative, Gradient, Some other expressions involving  $\nabla$ , Green's Theorem in the plane, The Divergence and the Divergence theorem. Gauss's law, The curl and Stoke's theorem.

**Reference Book :**

Mathematical Methods in Physical Sciences by M. L. Boas (John Wiley & Sons) Chapter 6  
Introduction to Classical Mechanics by R. G. Takwalw and P. S. Puranik (Tata McGraw-Hill Pub. Com. Ltd.) Chapters 1,2.

**UNIT – II : Waves:**

**Traveling Waves**

Speed of propagation of waves in a stretched string longitudinal waves in a bar, Plane waves in a fluid, transmission of energy by a traveling wave.

**Sound waves**

Introduction, Intensity & intensity level, Loudness & pitch radiation from a piston, diffraction, radiation efficiency of a sound source.

Newton's and Langrang correction.

**Ultrasonics**

Magnestriction method, Piezo-electric oscillator, Piezo-electric detectors, Measurement of velocity of ultrasonic waves, diffraction effect & its application to determine the velocity of the waves, the ultrasonic waves & its use.

**Reference Book :**

Mechanics, Wave motion & Heat by Francis Weston Sears (Addison Wesley Publication)

Articles : 16.3 to 16.6, 18.1, 18.2, 18.3, 18.6, 18.7

A text book on oscillations, waves & Acoustics by M. Ghosh, D. Bhattacharya (S. Chand)

Chapter 23 : Art 23.1 to 23.6

**Unit – III : Optics:**

**Farmat's principle and its applications:**

Farmat's principle of least time, laws at reflection, laws of refraction.

**Interference in thin films:**

Thin film, Plane parallel film, Interference due to transmitted light, Haidinger fringes, variable thickness (wedge-shaped) film, Newton's ring.

**Matrices:**

Types of matrices, Inversion of a Matrix, Rank of a Matrix, Diagonalization (3X3 only) .

**Matrix Method in Optics :**

Introduction, The matrix method, Unit planes, Nodal point planes, A system of two thin lenses.

**Reference Book :**

A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhulu, S. Chand

Publication: Articles : 2.2, 2.5, 2.6, 15.1 to 15.6 (including all sub articles)

Optics – Ajay Ghatak, TMH Edition, Articles : 3.1 to 3.5  
Principle of optics – B. K. Mathur

#### **Unit – IV : LASERS**

Introduction, Attenuation of light in an optical medium, Thermal equilibrium, Interaction of light with matter, Einstein coefficients and their relations, Light amplification, Meeting the three requirements, Components of Laser, Lasing action, Principal pumping schemes, Type of lasers, Semiconductor laser, Laser beam characteristics, Applications

#### **Reference Books:**

A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhanulu, S. Chand

Publication: Chapter 22 (including all sub articles)

Fiber Optics and optoelectronics by R. P. Khare, Oxford University Press.

An introduction to LASERS- Theory and Applications by M. N. Avadhanulu, S. Chand & Comp. Ltd.,

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**PHYSICS Practicals : PHY-102**

1. **Newton's Ring**  
To find the wave length of light of given monochromatic source  
To find the radius of curvature of given lens.
2. **Cauchy's Constant**  
To determine Cauchy's constant A and B using given formula and to find the wavelength of unknown line of a mercury spectrum. To determine Cauchy's constant A and B graphically and to find the wavelength of unknown line of a mercury spectrum.
3. **Melde's Experiment.**  
(i) To prove  $P/L$  constant. (ii) To prove  $T/l^2$  constant
4. **Resonator**  
To test the accuracy of relation  $n^2 (V + Kv) = \text{constant}$  and to determine the frequency of unknown fork.
5. **Optical Lever**  
To determine the flatness and refractive index of glass plate and radius of curvature of lenses by optical lever.
6. **To Determine Wave length of LASER light**
7. **Diagonalization of given matrix (2x2). Evaluate trace of a matrix.**  
Remuneration to the Deputy Coordinator
8. **Value of capacitance**  
For given two capacitors determine the value of capacitance for each of them. AND (i) by connecting them in series. (ii) by connecting them parallel.
9. **Value of inductance**  
For given two inductors determine the value of inductance for each of them and (i) by connecting them in series (ii) by connecting them parallel.
10. **Study of Transformer**  
To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.
11. **Decay Constant**  
To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.
12. **Logic Gates (AND, OR, NOT) (Using discrete components)**  
Verification of truth tables and giving understanding of voltage level for '0' and '1' level.
13. **Half-Wave Rectifier**  
Obtain load characteristic and %regulation for Full-wave rectifier with-out filter circuit and by using capacitor filter circuit. Determine ripple factor for Full wave rectifier without filter only.
14. **Series Resonance**  
To determine the frequency of a.c. emf by series resonance circuit varying capacitor.

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To find the radius of curvature of given lens.
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To determine Cauchy's constant A and B using given formula and to find the wavelength of unknown line of a mercury spectrum. To determine Cauchy's constant A and B graphically and to find the wavelength of unknown line of a mercury spectrum.
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- 5. Optical Lever**  
To determine the flatness and refractive index of glass plate and radius of curvature of lenses by optical lever.
- 6. To Determine Wave length of LASER light**
- 7. Diagonalization of given matrix (2x2). Evaluate trace of a matrix.**

**Group – B:**

- 1. Value of capacitance**  
For given two capacitors determine the value of capacitance for each of them. AND (i) by connecting them in series. (ii) by connecting them parallel.
- 2. Value of inductance**  
For given two inductors determine the value of inductance for each of them and (i) by connecting them in series (ii) by connecting them parallel.
- 3. Study of Transformer**  
To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.
- 4. Decay Constant**  
To verify the exponential law for the decay of a charged capacitor and determine the decay constant of the capacitor.
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