GUJARAT UNIVERSITY
Syllabus for First Year B.Sc.: Semester – I
Effective from June 2023
DSC-C-PHY-111T (4 Credit)
Vectors, Waves, Optics and LASER

UNIT – I: VECTOR ANALYSIS **[15 Hours]**

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

Reference Books:

1. Mathematical Methods in Physical Sciences by M. L. Boas (John Wiley & Sons) Chapter 6

2. Introduction to Classical Mechanics by R. G. Takwale and P. S. Puranik (Tata McGraw-Hill Pub. Com. Ltd.) Chapters 1,2.

UNIT – II: WAVES **[15 Hours]**

Velocity of Acoustic Waves
Velocity of plane longitudinal waves, discuss on the velocity of sound through gases (Newton's value, Laplace's correction), Velocity of longitudinal wave in a solid medium, Velocity of transverse wave propagating along a string stretched under tension.

Speech and Hearing
Human voice, Hearing ear and its structure, mechanism of hearing, Threshold of hearing.

Musical Sound
Musical sound, Musical scale.

Ultrasonics
Magnetostriction method, Piezo-electric oscillator to generate ultrasonics, Measurement of velocity of ultrasonic waves, the ultrasonic waves & its uses.

Reference Books:

1. A text book on oscillations, waves & Acoustics by M. Ghosh, D. Bhattacharya, (S. Chand) Articles: 9.1 to 9.3, 9.5, 18.1, 18.2, 18.4, 19.1, 19.2, 23.1, 23.2, 23.4 and 23.6

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

UNIT – III: OPTICS **[15 Hours]**

Farmat's principle and its applications:
Farmat's principle of least time, First and second laws of reflection, First and second 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. Michelson Interferometer, Applications of Michelson interferometer, Fabry-Perot interferometer and etalon

Reference Books:

1. A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnulu, S. Chand Publication.
Articles: 2.2, 2.5, 2.6, 15.1 to 15.8, 15.12 (including all sub articles, except 15.2.5, 15.6.10 and 15.12.3)
2. Optics – Ajay Ghatak, TMH Edition
3. Principle of optics – B. K. Mathur

UNIT – IV: LA SERS **[15 Hours]**

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 (excluding Carbon Dioxide Laser), Semiconductor laser, Laser beam characteristics, Applications

Reference Books:

1. A text book of Optics by N. Subrahmanyam, Brijlal and M. N. Avadhnulu, S. Chand Publication:
Chapter 22 (including all sub articles)

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

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

GUJARAT UNIVERSITY
Syllabus for First Year B.Sc.: Semester – I
Effective from June 2023
DSC-C-PHY-112P (4 Credit)
General Physics, Optics, Electronics
[120 Hours]

GROUP: A

1. **To find the prism angle and refractive index of a prism using spectrometer.**
2. **Melde's Experiment.**

   (i) To prove P/L constant. (ii) To prove T/L^2 constant

3. **Resonator**
   To test the accuracy of relation $n^2 (V + Kv)$ = constant and to determine the frequency of unknown fork.

4. **Flywheel**
   To determine the moment of inertia.

5. **To find the moment of inertia of a rolling body about an axis passing through the centre of the body on an inclined plane.**

6. **Study of travelling microscope**
   To find distance between two given points, to find diameter of a ring, to find inner and outer diameter of a rubber tube

7. **Plotting of a graph and error estimation on graphical plot**
   - Linear (find slope and intercept) and nonlinear graph
   - Logarithmic graph
   - Polar graph

8. **Simple pendulum**
   Find the relaxation time and quality factor

9. **Study of magnetic field of bar magnet with compass**
   - of a bar magnet
   - of likes poles facing each other
   - of unlike poles facing each other

10. **'g' by Bar pendulum**
    To obtain the value of 'g' by bar pendulum.

11. **Liquid lens**
    Find the refractive index of the given liquid

12. **Analysis of error**

GROUP: B

1. • Measurement of resistance, capacitor and inductance using multimeter
• Study of diode using multimeter
• Resistance value using colour code
• Testing of continuity and fuse

2. Measurement of Boltzmann's constant using Diode

3. To measure a threshold current of a LASER diode at room temperature.

4. Thevenin and Norton theorem

5. Maximum power transfer theorem

6. Value of capacitance
For given two capacitors determine the value of capacitance for each of them (i) by connecting them in series and (ii) by connecting them parallel.

7. Value of inductance
For given two inductors determine the value of inductance for each of them (i) by connecting them in series and (ii) by connecting them parallel.

8. Study of Transformer
To determine (i) turn ratio (ii) percentage efficiency (iii) energy loss due to copper, for a given transformer.

9. Logic Gates (AND, OR, NOT) (Using discrete components)
Verification of truth tables and giving understanding of voltage level for '0'and '1'level.

10. Half-Wave Rectifier
Obtain load characteristic and % regulation of Half-wave rectifier without filter and with capacitor filter. Determine ripple factor also.

11. Series Resonance
To determine the frequency of a.c. emf by series resonance circuit varying capacitor.

12. Diagonalization of matrix

Reference book:

1. Advanced practical physics for students by Worsnop and Flint
2. B. Sc. Practical Physics by C. L. Arora; S. Chand Publication
3. Practical Physics by G. L. Squires.
4. Practical Physics by Gupta and Kumar; Pragati Prakashan