VEER NARMAD SOUTH GUJARAT UNIVERSITY
Syllabus for B. Sc. Semester I
Subject: Physics (PHY-1001)
Paper – I
[2 credit course- 3 hours per week]

Unit – I **MECHANICS** **Duration: 15 hrs**

Rotation (2.1), angular velocity (2.2), angular acceleration (2.3), couple (2.4), work done by a couple (2.5), relation between couple & angular acceleration (2.6), centripetal force (2.10), centrifugal force (2.11)

Moment of inertia and its physical significance-radius of gyration (3.1), expression for the moment of inertia (3.2), torque (3.3), general theorems on moment of inertia (a) the principle or theorem of perpendicular axes (i) for a plane laminar body (b) the principle or theorem of parallel axes (i) case of a plane laminar body (3.4)

[*Elements of properties of matter by D S Mathur, S Chand & co.*]

Unit – II **PROPERTIES OF MATTER (ELASTICITY)** **Duration: 15 hrs**

[Introduction, load, Stress and strain, Hooke's law] (Revision) (8.1 to 8.3)

Three types of elasticity (8.8), equivalence of a shear to a compression and an extension at right angles to each other (except corollary) (8.9), deformation of a cube-bulk modulus (8.12), modulus of rigidity (8.13), Young's modulus (8.14), relation connecting elastic constants (8.15), Poisson's ratio (8.16), Relations for K and η in terms of Poisson's ratio (8.17), limiting value of σ (8.18), twisting couple of a cylinder (8.22), Torsional pendulum (8.26), determination of the coefficient of rigidity η for a wire or rod (a) horizontal twisting apparatus for a rod (8.27).

[*Elements of properties of matter by D S Mathur, S Chand & co.*]

Unit – III **THERMODYNAMICS** **Duration: 15 hrs**

Temperature (18.2), the zeroth law of thermodynamics (18.3), Temperature and heat (18.7), the absorption of heat by solids and liquids (18.8), a closer look at heat and work (18.9), the first law of thermodynamics (18.10), some special cases of first law of thermodynamics (18.11), heat transfer mechanisms (18.12)
Pressure, temperature and rms speed (19.4), translational kinetic energy (19.5)
Irreversible processes & entropy (20.2), change in entropy (20.3), the second law of thermodynamics (20.3), Carnot engine (20.5), refrigerator (20.6)
[*Fundamentals of Physics by Resnick, Halliday & Walker, 8th ed*]

Note: Illustrative problems on all the relevant topics should be covered.

Reference books:

1. University physics by Sears & Zimansky.
2. University physics by Freedman
3. Berkeley physics course volume I.
4. Mechanics by D. S. Mathur
5. Mechanics by J. C. Upadhyay
6. Heat & thermodynamics by Zeemansky
7. Heat & thermodynamics by Brij Lal & Subrahmanyam

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Syllabus for B. Sc. Semester I
Subject: Physics (PHY-1002)
Paper – II
[2 credit course- 3 hours per week]

Unit – I **VECTORS** **Duration: 15 hrs**

[Scalar and vector quantities (1.1), addition and subtraction of vectors (1.8), addition of more than two vectors (1.9), rectangular components of a vector (1.11)] (Revision)
Position vector (1.12), product of two vectors (1.15), scalar product (1.16), important points about scalar products (1.17), some illustrative applications of scalar product (1.18), vector product (1.19), important points about vector products (1.20), some illustrative applications of vector product (1.21), Triple product of vectors (1.22), scalar triple product (1.23), vector triple product (1.24), evaluation of vector triple product (1.25), scalar and vector fields (1.33), partial derivatives – gradient (1.34), the operator ∇ (1.35), magnitude and direction of $\nabla\emptyset$ (1.36), divergence and curl (1.37), applications of divergence and curl (1.38), some useful results (1.39), the Laplacian operator (1.40)
[*Mechanics by D S Mathur, 2nd ed*]

Unit – II **ELECTROSTATICS** **Duration: 15 hrs**

The inverse square law (2.3), electrostatic field and intensity (2.6), Gauss' theorem in electrostatics (2.9), Poisson's and Laplace's equations for an electric field (2.3),
Meaning of potential (3.1), vector form (3.2)(a), electric dipole (3.4)
Capacity (4.1), energy stored in the field of a charged condenser (4.4)
[*Fundamentals of magnetism & electricity by D. N. Vasudeva*]

Unit – III **GEOMETRICAL OPTICS** **Duration: 15 hrs**

Fermat's principle (1.3), derivation of the laws of reflection (1.3(2)), derivation of the laws of refraction (1.3(3))

Deviation produced by a thin lens (2.5), equivalent focal length of two lenses separated by a finite distance (2.6), Power of a lens (2.7), Cardinal points of an optical system (2.8), principal foci & focal planes (2.9), principal points & principal planes (2.10)

Dispersion by a prism (3.13), refraction through a prism (3.14), angular & chromatic dispersions (3.16)

[*A textbook of Optics by Brij Lal and N. Subrahmanyam, reprint 2002*]

Note: Illustrative problems on all the relevant topics should be covered.

Reference books:

1. Vector analysis by Murray Spigel
2. Berkeley physics course volume I.
3. Introduction to Electrodynamics by D J Griffiths
4. Electricity & magnetism by Sehgal, Chopra & Sehgal
5. Electromagnetism by Grant & Philips
6. Electricity & magnetism by Rangwala & Mahajan
7. Fundamentals of optics by Jenkins & White
8. Optics by A. K. Ghatak

List of experiments
Semester – I

	Group A
1	Error analysis
2	To verify the parallel axes theorem of moment of inertia
3	To verify the perpendicular axes theorem of moment of inertia
4	Modulus of rigidity of a wire using torsional pendulum
5	Modulus of rigidity of a rod by Searle's apparatus
6	Thermal conductivity of a bad conductor by Lee's method

	Group B
1	Low resistance by Wheatstone's bridge method of projection
2	Study of decay of current in RC circuit
3	Cardinal points of a lens system placed in air
4	Determination of refractive index of liquid using lens system
5	Dispersive power of the material of a prism using spectrometer
6	Resistivity of the material of a conductor using Ohm's law

Note:

1. The duration of each experiment is of 2 hours. Two such experiments are to be performed by each student per week.
2. In the external exam, a student will have to perform two experiments, each experiment of 2 hours duration.
3. It is recommended that there should not be more than 20 students per batch in the external exam.

VEER NARMAD SOUTH GUJARAT UNIVERSITY
Syllabus for B. Sc. Semester II
Subject: Physics (PHY-2001)
Paper – I
[2 credit course- 3 hours per week]

Unit – I **OSCILLATIONS AND WAVES** **Duration: 15 hrs**

Wave motion (4.1), what propagates in wave motion? (4.2), Characteristics of wave motion (4.3), transverse wave motion (4.4), longitudinal wave motion (4.5), definitions (4.6), relations between frequency and wavelength (4.7), equation of simple harmonic waves (4.11), Differential equation of wave motion (4.12), particle velocity wave velocity (4.13), energy of progressive waves (4.15)

Laws of transverse vibrations in a string (7.3), verification of the laws of transverse vibrations of the string (7.4), Melde's experiment (7.5)

[*Waves and oscillations by Brij Lal and Subrahmanyam*]

Unit – II **PROPERTIES OF MATTER** **Duration: 15 hrs**

Bending of beams (8.29), the cantilever (8.30), depression of a beam supported at the ends (8.33), determination of Y by bending of a beam (8.34), Konig's double mirror for determining Y for the material of a beam, (8.35), determination of elastic constants by Searle's method (8.36)

[*Elements of Properties of Matter by D S Mathur, 11th ed*]

Unit – III **MODERN PHYSICS** **Duration: 15 hrs**

Black body radiation (2.2), photoelectric effect (2.3), what is light (2.4), X-rays (2.5), X-ray diffraction (2.6), Compton effect (2.7)
[*Concepts of Modern Physics by A Beiser*]

Note: Illustrative problems on all the relevant topics should be covered.

Reference books:

1. Oscillations & waves by H. J. Pain
2. Oscillations & waves by Brij Lal & Subrahmanyam
3. Oscillations & waves by Bajaj
4. Mechanics by Saty Prakash & Agarwal
5. Atomic & nuclear physics by J. B. Rajam
6. Atomic & nuclear physics by Brij Lal & Subrahmanyam
7. Modern physics by K. Crane
8. Modern physics by Murugeshan
9. Introduction to Modern Physics by Richtmyer, Kennard, Cooper

Veer Narmad South Gujarat University
Syllabus for B. Sc. Semester II
Subject: Physics (PHY-2002)
Paper – II
[2 credit course- 3 hours per week]

Unit – I **MAGNETISM** **Duration: 15 hrs**

Law of force between two magnetic poles (7.2), magnetic field-lines and tubes of forces (7.3, 7.4), behavior of a magnetic substance in a magnetic field permeability induction (7.5), magnetic flux and flux density (7.5(a)), magnet in a magnetic field (7.6), intensity or surface density o magnetization of a magnet (7.7), intensity of magnetic field at a point due to a bar magnet (7.8)

[*Fundamentals of magnetism & electricity by D. N. Vasudeva*]

Unit – II **OPTICS** **Duration: 15 hrs**

Introduction (8.1), coherent sources (8.3), phase difference & path difference (8.4), theory of interference fringes (8.6), Fresnel's biprism (8.8), interference in thin films (8.15), interference due to reflected light (thin film) (8.16), fringes produced by a wedge-shaped thin film (8.21), Newton's rings (for reflected light only) (8.23), determination of the wavelength light using Newton's rings (8.24), refractive index of a liquid using Newton's rings (8.25)

[*A textbook of Optics: Brij Lal and Subrahmanyam, 22nd ed*]

Unit – III **ELECTRONICS** **Duration: 15 hrs**

[Introduction (17.1), unregulated power supply (17.2), regulated power supply (17.3), rectifiers (17.5)] (Revision)
Full-wave rectifier (17.8), filters (17.9), series inductor filter (17.10), shunt capacitor (17.11), LC filter (17.13), the CLC or Pi filter (17.14)
Zener diode (15.1), voltage regulation (15.2)
[*Basic electronics by B L Theraja*]
Binary to decimal conversion (4.2), decimal to binary conversion (4.3), octal numbers (4.4), hexadecimal numbers (4.5)
[*Digital principles & applications by A P Malvino & Leach, Mc-graw hill int edition*]

Note: Illustrative problems on all the relevant topics should be covered.

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2. Electromagnetism by Grant & Philips
3. Electricity & magnetism by Rangwala & Mahajan
4. Electricity & magnetism by Sehgal, Chopra & Sehgal
5. Fundamentals of optics by Jenkins & White
6. Optics by A. K. Ghatak
7. Microelectronics by Millman & Grabel
8. Integrated electronics by Millman & Halkias
9. Electronics: Fundamentals & applications by Allen Mottershead
10. Basic electronics by B L Theraja

List of experiments

Semester – II

	Group A
1	Force constant (k) of a spring
2	Speed of transverse waves on a stretched wire of various linear densities using Sonometer
3	Elastic constants (Y, η, K & σ) by Searle's method
4	Melde's experiment
5	"Y" by cantilever
6	"Y" by bending of a beam supported at two ends & loaded in the middle

	Group B
1	Study of magnetic field due to Solenoid
2	Impedance of an LCR ac series network
3	Wattage of a lamp
4	Newton's ring experiment
5	Study of rectifiers
6	Zener diode as a voltage regulator

Note:

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