

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 lamina body (b) the principle or theorem of parallel axes (i) case of a plane lamina 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 $\nabla\phi$ (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 Spiegel
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.

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 Murugesan
9. Introduction to Modern Physics by Richtmyer, Kennard, Cooper

[Digital principles & applications by A P Malvino & Leach, Mc-graw hill int edition]

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

Reference books:

1. Introduction to Electrodynamics by D J Griffiths
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 (λ , μ , & ν) by Searle's method
4	Melde's experiment
5	" " by cantilever
6	" " 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:

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 will not be more than 20 students per batch in the external exam.

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Syllabus for B. Sc. Semester III

Subject: Physics (PHY-3003)

Paper – III

[2 credit course- 2 hours per week]

Unit – I

MECHANICS

Duration: 15 hrs

[Some definitions & preliminary relations (4.3)] (Revision)

Charged particle in a uniform & constant electric field (4.4), Charged particle in an alternating electric field (4.5), charged particle in a uniform & constant magnetic field (4.6), the cyclotron (4.7), magnetic focusing (4.8), charged particle in a combined electric & magnetic field (4.9)

[*Mechanics by D S Mathur, S Chand & co*]

Unit – II

THERMODYNAMICS

Duration: 15 hrs

Thermodynamic variables (6.1), extensive & intensive variables (6.2), Maxwell's thermodynamic variables (6.3), applications of Maxwell's thermodynamic relations (6.4), thermodynamic potentials (6.5), significance of thermodynamic potentials (6.6), relation of thermodynamic potentials with their variables (6.7), relations between μ , η & ϕ (6.8), the μ equations (6.9), Clapeyron's equation using Maxwell's thermodynamic relations (6.10)

[*Heat & thermodynamics by Brij Lal & Subrahmanium*]

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 J. C. Upadhyay
5. Mechanics by Satya Prakash & Agarwal
6. Heat & thermodynamics by Zeemansky

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Syllabus for B. Sc. Semester III

Subject: Physics (PHY-3004)

Paper – IV

[2 credit course- 2 hours per week]

Unit – I

MODERN PHYSICS

Duration: 15 hrs

De Broglie waves (3.1), waves of what (3.2), describing a wave (3.3), phase & group velocities (3.4), particle diffraction (3.5), particle in a box (3.6), uncertainty principle 1 (3.7), uncertainty principle 2 (3.8), applying the uncertainty principle (3.9)

[Concepts of modern physics by A Beiser]

Unit – II

OPTICS

Duration: 15 hrs

Plane transmission grating (9.33), theory of plane transmission grating (9.34), oblique incidence (9.36)

Introduction (10.1), polarization of transverse waves (10.2), plane of polarization (10.3), polarization by reflection (10.4), Brewster's law (10.6), polarization by refraction (10.8), Malus' law (10.9), Optical activity (10.31), specific rotation (10.34), Laurent's half shade polarimeter (10.35)

[A text book optics by Brij Lal & Subramanyam]

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

Reference books:

1. Modern physics by J B Rajam
2. Modern physics by Murugesahan
3. Atomic & nuclear physics by Brij Lal & Subramanyam
4. Fundamentals of optics by Jenkins & White
5. Optics by A K Ghatak

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Syllabus for B. Sc. Semester III

Subject: Physics (PHY-3005)

Paper – V

[2 credit course- 2 hours per week]

Unit – I

ELECTROMAGNETISM

Duration: 15 hrs

AC through inductance, capacitance and resistance in series, or the LCR series circuit (22.11), series resonant circuit (22.13), parallel or branched ac circuit (22.14)

AC bridge (22.23), measurement of an inductance (22.24), measurement of capacity de Sauty's method (22.25), Schering bridge for measuring capacitance (22.26), measurement of frequency of an AC supply (22.27)

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

Unit – II

ELECTRONICS

Duration: 15 hrs

Thevenin's theorem (1.5), Norton's theorem (1.6)

Voltage-divider bias (8.1), accurate VDB analysis (8.2), VDB load line & Q point (8.3), other types of bias (8.5)

Basic ideas (13.1), drain curves (13.2), the trans-conductance curve (13.3), biasing in the ohmic region (13.4), biasing in the active region (13.5), trans-conductance (13.6)

[*Electronic principles by Malvino, TMH*]

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

Reference books:

1. Electromagnetism by Grant & Philips
2. Electricity & magnetism by Rangwala & Mahajan
3. Electricity & magnetism by Sehgal, Chopra & Sehgal
4. Microelectronics by Millman & Grabel
5. Integrated electronics by Millman & Halkias
6. Electronics: Fundamentals & applications by Allen Mottershead
7. Basic electronics by B L Theraja

List of experiments Semester III

GROUP A	
1.	Moment of inertia by torsional pendulum (disc & irregular body)
2.	Moment of inertia by bifilar suspension
3.	Flat spiral spring (determination of λ)
4.	"Y" by the method of elevation
5.	Stefan's fourth power law
6.	Study of Simple Harmonic Motion
GROUP B	
1.	Optical lever
2.	Brewster's law
3.	"h" by photocell
4.	Diffraction grating (normal incidence)
5.	Cauchy's constants
6.	Resolving power of telescope
GROUP C	
1.	Thevenin's theorem
2.	Figure of merit of a ballistic galvanometer
3.	Energy band gap of a semiconductor diode
4.	Low resistance by Carey-Foster's bridge
5.	Transistor characteristics in CE configuration
6.	"L" by Maxwell's bridge

Note:

1. The duration of each experiment is of 3 hours. Three experiments are to be performed by each student per week.
2. In the external exam, a student will have to perform three experiments, each experiment of 3 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 IV

Subject: Physics (PHY-4003)

Paper – III

[2 credit course- 2 hours per week]

Unit – I

INSTRUMENTATION

Duration: 15 hrs

[Introduction (19.1), Monochromatic light (19.2), Polarized Wave Shapes (19.3)]Revision
Reflection absorption and transmittance (19.5), radiometry and photometry (19.6),
terms relating to photometry (19.7), laws of illumination (19.11), terms relating to
radiometry (19.12), photometric/radiometric measurement systems (19.13), optical
sources (19.14), optical detectors (19.15)

[*A course in Electrical and electronic measurements and instrumentation by A K
Sawhney, Dhanpat Rai & Co*]

Unit – II

SOLID STATE PHYSICS

Duration: 15 hrs

Introduction (1.1), the crystalline state (1.2), basic definitions (1.3), the fourteen bravais
lattices & seven crystal systems (1.4), elements of symmetry (1.5), nomenclature of
crystal directions & crystal planes, Millar indices (1.6), examples of simple crystal
structures (1.7), inter-atomic forces (1.9), types of bonding (1.10)

[*Elementary solid state physics by M. Ali Omar, Perason education*]

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

Reference books:

1. Solid state physics by C Kittal
2. Solid state physics by Kachhawa

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Syllabus for B. Sc. Semester III

Subject: Physics (PHY-4004)

Paper – IV

[2 credit course- 2 hours per week]

Unit – I

MODERN PHYSICS

Duration: 15 hrs

Quantum mechanics (5.1), the wave equation (5.2), Schrodinger's equation: Time dependent form (5.3), linearity & superposition (5.4), expectation values (5.5), operators (5.6), Schrodinger's equation: Steady state form (5.7), particle in a box (5.8), finite potential well (5.9)

[*Concepts of modern physics by A Beiser*]

Unit – II

OPTICS

Duration: 15 hrs

Aberrations (3.1), spherical aberrations in a lens (3.5), reducing spherical aberrations (3.6), coma (3.7), aplanatic lens (3.8), astigmatism (3.9), curvature of the field (3.10), distortion (3.11), chromatic aberration (3.12), achromatic lenses (3.27), condition for achromatism of two thin lenses separated by finite lenses (3.28)

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

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

Reference books:

1. Modern physics by J B Rajam
2. Modern physics by Murugesahan
3. Atomic & nuclear physics by Brij Lal & Subramanyam
4. Fundamentals of optics by Jenkins & White
5. Optics by A. K. Ghatak

VEER NARMAD SOUTH GUJARAT UNIVERSITY

Syllabus for B. Sc. Semester IV

Subject: Physics (PHY-4005)

Paper – V

[2 credit course- 2 hours per week]

Unit – I

ELECTROMAGNETISM

Duration: 15 hrs

Galvanometers (14.1), moving iron galvanometers (14.2), moving coil galvanometer (14.3), the sensitivity (14.4), ballistic galvanometer (14.8), moving coil ballistic galvanometer (14.9), damping (14.10), current and charge sensitivities (14.12), measurement of sensitivity of a galvanometer (14.13), uses of ballistic galvanometer (14.14)

[Fundamentals of magnetism and electricity by D N Vasudeva]

Unit – II

ELECTRONICS

Duration: 15 hrs

Base-biased amplifier (9.1), emitter-biased amplifier (9.2), small-signal operation (9.3), AC beta (9.4), AC resistance of the emitter diode (9.5), analyzing an amplifier (9.7) JFET amplifiers (13.7)

The depletion mode MOSFET (14.1), the enhancement mode MOSFET (14.2)

[Electronic principles by Malvino]

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

Reference books:

1. Electromagnetism by Grant & Philips
2. Electricity & magnetism by Rangwala & Mahajan
3. Electricity & magnetism by Sehgal, Chopra & Sehgal
4. Microelectronics by Millman & Grabel
5. Integrated electronics by Millman & Halkias
6. Electronics: Fundamentals & applications by Allen Mottershead
7. Basic electronics by B L Theraja

List of experiments
Semester – IV

Group A	
1	Moment of inertia of a flywheel
2	Bar pendulum
3	Flat spiral spring (determination of “Y”)
4	Thermocouple
5	Study of resonator
6	Specific heat of liquid by Newton’s law of cooling
Group B	
1	Cylindrical obstacle (wavelength of light)
2	Spherical aberration
3	Polarimeter
4	Diffraction grating (minimum deviation)
5	Malus’ law
6	Rydberg’s constant
Group C	
1	FET characteristics
2	Mutual inductance by ballistic galvanometer
3	Norton’s theorem
4	k/e using transistor
5	De Sauty’s bridge (comparison of capacitances)
6	TCR of thermistor using post office box

Note:

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