SATAVAHANA UNIVERSITY

B.Sc. (Physics)

SCHEME FOR CHOICE BASED CREDIT SYSTEM

(YEAR & SEMESTER - WISE SCHEME OF HPW, CREDITS & MARKS)

YEAR	SEM	Course/Paper	Course Type*	Hrs / Week	No. of Credits	Marks		
						Internal	SEM End	Total
FIRST	I	Mechanics & Oscillations	DSC-1	4	4	20	80	100
		Mechanics & Oscillations Lab (Practicals)	DSC-1(Pr)	3	1	-	25	25
	II	Thermal Physics	DSC-2	4	4	20	80	100
		Thermal Physics Lab (Practicals)	DSC-2(Pr)	3	1	-	25	25
SECOND	III	Electromagnetic Theory	DSC-3	4	4	20	80	100
		Electromagnetic Theory Lab (Practicals)	DSC-3(Pr)	3	1	-	25	25
		1) Experimental methods & Error analysis 2) Electrical circuits & Networking	SEC-1 SEC-2	2 2	2 2	10 10	40 40	50 50
	IV	Waves & Optics	DSC-4	4	4	20	80	100
		Waves & Optics Lab (Practicals)	DSC-4(Pr)	3	1	-	25	25
		1) Basic Instrumentation 2) Digital Electronics	SEC-3 SEC-4	2 2	2 2	10 10	40 40	50 50
THIRD	V	(A) Modern Physics Or (B) Computational Physics	DSE-1	4	4	20	80	100
		(A) Modern Physics Lab (Practicals) Or (B) Computational Physics Lab (Practicals)	DSE-1 (Pr)	3	1	-	25	25
		Renewable energy & Energy harvesting	GE	4	4	20	80	100
	VI	(A) Electronics Or (B) Applied Optics	DSE-2	4	4	20	80	100
		(A) Electronics Lab (Practicals) Or (B) Applied Optics Lab (Practicals)	DSE-2 (Pr)	3	1	-	25	25
		Nanoscience	Project / Course in lieu of project	4	4	20	80	100
Total					**30 + 16**	**120+80**	**630+320**	**750 + 400**

**DSC: Discipline Specific Course (Core);*
DSE: Discipline Specific Elective (Elective);
Pr: Practical
SEC: Skill Enhancement Course;
GE: Generic Elective

B.Sc. (Physics)- I Year
Semester – I
Paper – I: Mechanics and Oscillations
(DSC-1: Compulsory)

Total: 56 hrs
(4 Hrs / week)

Unit – I

1. Vector Analysis (14)

Scalar and Vector fields, Gradient of a Scalar field and its physical significance. Divergence and Curl of a Vector field and related problems. Vector integration - line, surface and volume integrals. Stokes, Gauss's and Green's theorems - simple applications.

Unit – II

2. Mechanics of Particles (7)

Laws of motion, motion of variable mass system, motion of a rocket, multi-stage rocket, conservation of energy and momentum. Collisions in two and three dimensions, concept of impact parameter, scattering cross-section.

3. Mechanics of Rigid Bodies (7)

Definition of Rigid body, rotational kinematic relations, equation of motion for a rotating body, angular momentum and inertial tensor. Euler's equations, precession of a top, Gyroscope.

Unit – III

4. Central Forces (8)

Central forces – definition and examples, conservative nature of central forces, conservative force as a negative gradient of potential energy, equation of motion under a central force, gravitational potential and gravitational field, motion under inverse square law, derivation of Kepler's laws.

5. Special theory of Relativity (8)

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, mass-energy relation. Concept of four vector formalism.

Unit – IV

6. Oscillations (12)

Simple harmonic oscillator and solution of the differential equation – Physical characteristics of SHM, Torsion pendulum – Measurement of rigidity modulus, Compound pendulum - Measurement of 'g', combination of two mutually perpendicular simple harmonic vibrations of same frequency and different frequencies, Lissajous figures.

Damped harmonic oscillator, Solution of the differential equation of damped oscillator. Energy considerations, Logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance.

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books

1. Berkeley Physics Course. Vol.1, **Mechanics** by C. Kittel, W. Knight, M.A. Ruderman - *Tata-McGraw hill Company Edition 2008*.
2. **Fundamentals of Physics**. Halliday/Resnick/Walker *Wiley India Edition 2007*.
3. **First Year Physics** - *Telugu Academy*.
4. **Introduction to Physics for Scientists and Engineers**. F.J. Ruche. *McGraw Hill*.
5. **Fundamentals of Physics** by Alan Giambattista et al *Tata-McGraw Hill Company* Edition, 2008.
6. **University Physics** by Young and Freeman, *Pearson Education, Edition 2005*.
7. **Sears and Zemansky's University Physics** by Hugh D. Young, Roger A. Freedman *Pearson Education Eleventh Edition*.
8. **An introduction to Mechanics** by Daniel Kleppner & Robert Kolenkow. *The McGraw Hill Companies*.
9. **Mechanics**. Hans & Puri. *TMH Publications*.
10. **Engineering Physics**. R.K. Gaur & S.L. Gupta. *Dhanpat Rai Publications*.
11. **The Feymman Lectures in Physics, Vol.-1**, R P Feymman, RB Lighton and M Sands, BI Publications,
12. **Mechanics-**P.K. Srivastava - New Age International.

B.Sc. (Physics) – I year
Semester - I
Paper – I: Mechanics and Oscillations Practicals
(DSC-1: Compulsory)

1. Measurement of errors – Simple Pendulum.
2. Calculation of slope and intercept of Y= mX +C graph by theoretical method (simple pendulum experiment)
3. Study of a compound pendulum- determination of 'g' and 'k'.
4. Y' by uniform Bending
5. Y by Non-uniform Bending.
6. Moment of Inertia of a fly wheel.
7. Rigidity modulus by Torsion Pendulum.
8. Determination of surface tension of a liquid through capillary rise method.
9. Determination of Surface Tension of a liquid by any other method.
10. Determination of Viscosity of a fluid.
11. Observation of Lissajous figures from CRO- Frequency ratio. Amplitude and phase difference of two waves.
12. Study of oscillations of a mass under different combination of springs- Series and parallel
13. Study of Oscillations under Bifilar suspension- Verification of axis theorems

***Note**: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava.

B.Sc. (Physics)- I Year
Semester – II
Paper – II: Thermal Physics
(DSC-2: Compulsory)

Total: 56 hrs
(4 Hrs / week)

Unit – I

1. Kinetic theory of gases: (6)

Introduction – Deduction of Maxwell's law of distribution of molecular speeds, Transport Phenomena – Viscosity of gases – thermal conductivity – diffusion of gases.

2. Thermodynamics: (8)

Basics of Thermodynamics - Carnot's engine (qualitative) - Carnot's theorem - Kelvin's and Clausius statements – Thermodynamic scale of temperature – Entropy, physical significance – Change in entropy in reversible and irreversible processes – Entropy and disorder – Entropy of universe – Temperature- Entropy (T-S) diagram – Change of entropy of a perfect gas-change of entropy when ice changes into steam.

Unit – II

3. Thermodynamic potentials and Maxwell's equations: (7)

Thermodynamic potentials – Derivation of Maxwell's thermodynamic relations – Clausius-Clayperon's equation – Derivation for ratio of specific heats – Derivation for difference of two specific heats for perfect gas. Joule Kelvin effect – expression for Joule Kelvin coefficient for perfect and Vanderwaal's gas.

4. Low temperature Physics: (7)

Joule Kelvin effect – liquefaction of gas using porous plug experiment. Joule expansion – Distinction between adiabatic and Joule Thomson expansion – Expression for Joule Thomson cooling – Liquefaction of helium, Kapitza's method – Adiabatic demagnetization – Production of low temperatures – Principle of refrigeration, vapour compression type.

Unit – III

5. Quantum theory of radiation: (14)

Black body-Ferry's black body – distribution of energy in the spectrum of Black body – Wein's displacement law, Wein's law, Rayleigh-Jean's law – Quantum theory of radiation - Planck's law – deduction of Wein's law, Rayleigh-Jeans law, Stefan's law from Planck's law. Measurement of radiation using pyrometers – Disappearing filament optical pyrometer – experimental determination – Angstrom pyroheliometer - determination of solar constant, effective temperature of sun.

Unit – IV

6. Statistical Mechanics: (14)

Introduction, postulates of statistical mechanics. Phase space, concept of ensembles and some known ensembles, classical and quantum statistics and their differences, concept of probability, Maxwell-Boltzmann's distribution law -Molecular energies in an ideal gas- Maxwell-Boltzmann's velocity distribution law, Bose-Einstein Distribution law, Fermi-Dirac Distribution law, comparison of three distribution laws.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books

1. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007.*
2. **Second Year Physics** – *Telugu Academy.*
3. **Modern Physics** by R. Murugeshan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co*.
4. **Modern Physics** by G. Aruldhas and P. Rajagopal, *Eastern Economy Education.*
5. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
6. **An Introduction to Thermal Physics** by Daniel V. Schroeder.*Pearson Education Low Price Edition*.
7. **Thermodynamics** by R.C. Srivastava, Subit K. Saha& Abhay K. *Jain Eastern Economy Edition.*
8. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications*.
9. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
10. **Introduction to Statistical Mechanics. ,** B.B. Laud, Macmillan, 1981
11. **Statistical Physics,** K.Haung, Wiley Eastern 1988

B.Sc. (Physics) – I year
Semester - II
Paper – II: Thermal Physics Practicals
(DSC-2: Compulsory)

1. Co-efficient of thermal conductivity of a bad conductor by Lee's method.
2. Measurement of Stefan's constant.
3. Specific heat of a liquid by applying Newton's law of cooling correction.
4. Heating efficiency of electrical kettle with varying voltages.
5. Calibration of thermo couple
6. Cooling Curve of a metallic body
7. Resistance thermometer
8. Thermal expansion of solids
9. Study of conversion of mechanical energy to heat.
10. Determine the Specific of a solid (graphite rod)

***Note**: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical Physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastava

B.Sc. (Physics)- II Year
Semester – III
Paper – III: Electromagnetic Theory
(DSC-3: Compulsory)

Total: 56 hrs
(4 Hrs / week)

Unit I : Electrostatics (14 Hrs)
Electric Field:- Concept of electric field lines and electric flux, Gauss's law (Integral and differential forms), application to linear, plane and spherical charge distributions. Conservative nature of electric field 'E', Irrotational field. Electric potential:- Concept of electric potential, relation between electric potential and electric field, potential energy of a system of charges. Energy density in an electric field. Calculation of potential from electric field for a spherical charge distribution.

Unit II : Magnetostatics (14 Hrs)
Concept of magnetic field 'B' and magnetic flux, Biot-Savart's law, B due to a straight current carrying conductor. Force on a point charge in a magnetic field. Properties of B, curl and divergence of B, solenoidal field. Integral form of Ampere's law, Applications of Ampere's law: field due to straight, circular and solenoidal currents. Energy stored in magnetic field. Magnetic energy in terms of current and inductance. Magnetic force between two current carrying conductors. Magnetic field intensity. Ballistic Galvanometer:- Torque on a current loop in a uniform magnetic field, working principle of B.G., current and charge sensitivity, electromagnetic damping, critical damping resistance.

Unit III: Electromagnetic Induction and Electromagnetic waves (14)
Faraday's laws of induction (differential and integral form), Lenz's law, self and mutual Induction. Continuity equation, modification of Ampere's law, displacement current, Maxwell equations. Maxwell's equations in vacuum and dielectric medium, boundary conditions, plane wave equation: transverse nature of EM waves, velocity of light in vacuum and in medium. Poynting's theorem.

UNIT IV:
Varying and alternating currents (7 Hrs)
Growth and decay of currents in LR, CR and LCR circuits-Critical damping. Alternating current, relation between current and voltage in pure R, C and L-vector diagrams - Power in ac circuits. LCR series and parallel resonant circuit-Q-factor. AC & DC motors-single phase, three phase (basics only).

Network Theorems (7 Hrs)
Passive elements, Power sources, Active elements, Network models: T and π Transformations, Superposition theorem, Thevenin's theorem, Norton's theorem. Reciprocity theorem and Maximum power transfer theorem (Simple problems).

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books:

1. Fundamentals of electricity and magnetism By Arthur F. Kip (McGraw-Hill, 1968)

2. Electricity and magnetism by J.H.Fewkes & John Yarwood. Vol.I (Oxford Univ. Press, 1991).

3. Introduction to Electrodynamics, 3rd edition, by David J. Griffiths, (Benjamin Cummings,1998).

4. Electricity and magnetism By Edward M. Purcell (McGraw-Hill Education, 1986)

5. Electricity and magnetism. By D C Tayal (Himalaya Publishing House,1988)

6. Electromagnetics by Joseph A.Edminister 2nd ed.(New Delhi: Tata McGraw Hill, 2006).

B.Sc. (Physics) – II year
Semester - III
Paper – III: Electromagnetic Theory Practicals
(DSC-3: Compulsory)

1. To verify the Thevenin Theorem
2. To verify Norton Theorem
3. To verify Superposition Theorem
4. To verify maximum power transfer theorem.
5. To determine a small resistance by Carey Foster's bridge.
6. To determine the (a) current sensitivity, (b) charge sensitivity, and (c) CDR of a B.G.
7. To determine high resistance by leakage method.
8. To determine the ratio of two capacitances by De Sauty's bridge.
9. To determine self-inductance of a coil by Anderson's bridge using AC.
10. To determine self-inductance of a coil by Rayleigh's method.
11. To determine coefficient of Mutual inductance by absolute method.
12. LR circuit
13. RC circuit
14. LCR series circuit
15. LCR parallel circuit

Note: Minimum of eight experiments should be performed.
Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

Suggested Books:

1. B. L. Worsnop and H. T. Flint, Advanced Practical Physics, Asia Publishing House, New Delhi.
2. InduPrakash and Ramakrishna, A Text Book of Practical Physics, KitabMahal

B.Sc. (Physics) - II Year
Semester – IV
Paper – IV: Waves and Optics
(DSC-4: Compulsory)

Total: 56 Hrs
(4 Hrs / week)

Unit-I: Waves (14 Hrs)

Fundamentals of Waves -Transverse wave propagation along a stretched string, general solution of wave equation and its significance, modes of vibration of stretched string clamped at ends, overtones, energy transport, transverse impedance.

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the midpoint iii) bar free at both ends iv) bar fixed at one end. Transverse vibrations in a bar- wave equation and its general solution. Boundary conditions, clamped free bar, free-free bar, bar supported at both ends, Tuning fork.

Unit II: Interference: (14 Hrs)

Principle of superposition – coherence – temporal coherence and spatial coherence – conditions for Interference of light.

Interference by division of wave front: Fresnel's biprism – determination of wave length of light. Determination of thickness of a transparent material using Biprism – change of phase on reflection – Lloyd's mirror experiment.

Interference by division of amplitude: Oblique incidence of a plane wave on a thin film due to reflected and transmitted light (Cosine law) – Colours of thin films – Non-reflecting films – interference by a plane parallel film illuminated by a point source – Interference by a film with two non-parallel reflecting surfaces (Wedge shaped film) – Determination of diameter of wire-Newton's rings in reflected light with and without contact between lens and glass plate, Newton's rings in transmitted light (Haidinger Fringes) – Determination of wave length of monochromatic light – Michelson Interferometer – types of fringes – Determination of wavelength of monochromatic light, Difference in wavelength of sodium D_1,D_2 lines and thickness of a thin transparent plate.

Unit III: Diffraction: (14 Hrs)

Introduction – Distinction between Fresnel and Fraunhofer diffraction, Fraunhofer diffraction:- Diffraction due to single slit and circular aperture – Limit of resolution – Fraunhofer diffraction due to double slit – Fraunhofer diffraction pattern with N slits (diffraction grating).

Resolving Power of grating – Determination of wave length of light in normal and oblique incidence methods using diffraction grating.

Fresnel diffraction-Fresnel's half period zones – area of the half period zones –zone plate – Comparison of zone plate with convex lens – Phase reversal zone plate – diffraction at a straight edge – difference between interference and diffraction.

Unit IV: Polarization (14 Hrs)

Polarized light : Methods of Polarization, Polarizatioin by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewster's law – Malus law – Nicol prism polarizer and analyzer – Refraction of plane wave incident on negative and positive crystals (Huygen's explanation) – Quarter wave plate, Half wave plate – Babinet's compensator – Optical activity, analysis of light by Laurent's half shade polarimeter.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books

1. **Optics** by AjoyGhatak. *The McGraw-Hill companies*.
2. **Optics** by Subramaniyam and Brijlal. *S. Chand & Co*.
3. **Fundamentals of Physics**. Halliday/Resnick/Walker.*C. Wiley India Edition 2007*.
4. **Optics and Spectroscopy**. R. Murugeshan and Kiruthiga Siva Prasath. *S. Chand & Co*.
5. **Second Year Physics** – *Telugu Academy.*
6. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications*.
7. **Feyman's Lectures on Physics** Vol. 1,2,3 & 4. *Narosa Publications.*
8. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
9. **Physical Optics,** K. Ghatak
10. **Optical and Atomic Physics,** D.P. Khandelwal, Himalaya Publishing House, Bombay,1988
11. **Fundamental of Optics,** Jenkins and White, McGraw-Hill
12. **Optics,** Smith and Thomson, John Wiley and sons

B.Sc. (Physics) – II year
Semester - IV
Paper – IV: Waves and Optics Practicals
(DSC-4: Compulsory)

1. Thickness of a wire using wedge method.
2. Determination of wavelength of light using Biprism.
3. Determination of Radius of curvature of a given convex lens by forming Newton's rings.
4. Resolving power of grating.
5. Study of optical rotation-polarimeter.
6. Dispersive power of a prism
7. Determination of wavelength of light using diffraction grating minimum deviation method.
8. Wavelength of light using diffraction grating – normal incidence method.
9. Resolving power of a telescope.
10. Refractive index of a liquid and glass (Boys Method).
11. Pulfrich refractometer – determination of refractive index of liquid.
12. Wavelength of Laser light using diffraction grating.
13. Verification of Laws of a stretched string (Three Laws).
14. Velocity of Transverse wave along a stretched string
15. Determination of frequency of a bar- Melde‟s experiment

***Note**: Minimum of eight experiments should be performed Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.*

Suggested Books

1. D.P. Khandelwal, "A laboratory manual for undergraduate classes" (Vani Publishing House, New Delhi).
2. S.P. Singh, "Advanced Practical Physics" (Pragati Prakashan, Meerut).
3. Worsnop and Flint- Advanced Practical physics for students.
4. "Practical Physics" R.K Shukla, Anchal Srivastav.

B.Sc. (Physics)- III Year
Semester – V
Paper – V(A) : Modern Physics
(DSE-1: Elective)

Total : 56 Hrs
(4 Hrs / week)

UNIT - 1 : SPECTROSCOPY (14 Hrs)

Atomic Spectra: Introduction - Drawbacks of Bohr's atomic model - Sommerfeld's elliptical orbits - relativistic correction (no derivation). Stern & Gerlach experiment, Vector atom model and quantum numbers associated with it. L-S and j-j coupling schemes. Spectral terms, selection rules, intensity rules-spectra of alkali atoms, doublet fine structure, Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

Molecular Spectroscopy: Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule. Determination of inter nuclear distance.Vibrational energies and spectrum of diatomic molecule. Raman effect, classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

UNIT – II :Quantum Mechanics (14 Hrs)

Inadequacy of classical Physics: Spectral radiation - Planck's law (only discussion). Photoelectric effect - Einstien's photoelectric equation. Compton's effect - experimental verification.

Matter waves & Uncertainty principle: de Broglie's hypothesis - wavelength of matter waves, properties of matter waves. Phase and group velocities. Davisson and Germer experiment. Double slit experiment. Standing de Brogile waves of electron in Bohr orbits. Heisenberg's uncertainty principle for position and momentum (x and p_X), Energy and time (E and t). Gamma ray microscope. Diffraction by a single slit. Position of electron in a Bohr orbit. Complementary principle of Bohr.

Schrodinger Wave Equation

Schrodinger time independent and time dependent wave equations. Wave function properties - Significance. Basic postulates of quantum mechanics. Operators, eigen functions and eigen values, expectation values.

Unit - III : Nuclear Physics (14 Hrs)

Nuclear Structure: Basic properties of nucleus - size, charge, mass, spin, magnetic dipole moment and electric quadrupole moment. Binding energy of nucleus, deuteron binding energy, p-p, n-n, and n-p scattering (concepts), nuclear forces. Nuclear models - liquid drop model, shell model.

Alpha and Beta Decays: Range of alpha particles, Geiger – Nuttal law. Gammow's theory of alpha decay. Geiger – Nuttal law from Gammow's theory. Beta spectrum - neutrino hypothesis,

Particle Detectors: GMcounter, proportionalcounter, scintillationcounter.

UNIT:IV:Solid State Physics &Crystalography (14 Hrs)

Crystal Structure: Crystalline nature of matter, Crystal lattice, Unit Cell, Elements of symmetry. Crystal systems, Bravais lattices. Miller indices. Simple crystal structures (S.C., BCC, FCC, CsCl, NaCl, diamond and ZincBlende)

X-ray Diffraction: Diffraction of X -rays by crystals, Bragg's law, Experimental techniques - Laue's method and powder method.

Bonding in Crystals: Types of bonding in crystals - characteristics of crystals with different bondings. Lattice energy of ionic crystals- determination of Madelung constant for NaCl crystal, Calculation of Born Coefficient and repulsive exponent. Born-Haber cycle.

NOTE: *Problems should be solved at the end of every chapter of all units.*

Suggested books:

1. Modern Physics by G. Aruldhas & P.Rajagopal. Eastern Economy Edition.
2. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
3. Modern Physics by R. Murugeshan and Kiruthiga SivaPrasath.S. Chand & Co.
4. Nuclear Physics by D.C. Tayal, Himalaya PublishingHouse.
5. Molecular Structure and Spectroscopy by G.Aruldhas. Prentice Hall of India, New Delhi.
6. Spectroscopy -Atomic and Molecular by Gurdeep R Chatwal and Shyam Anand -Himalaya Publishing House.
7. Third Year Physics – Telugu Academy.
8. Elements of Solid State Physics by J.P. Srivastava. (for chapter on nanomaterials)-Prentice-hall of India Pvt. Ltd.

B.Sc. (Physics) – III year
Semester – V
Paper- V(A) : Modern Physics Practicals
(DSE-1: Elective)

1. Measurement of Planck's constant using black body radiation and photo-detector
2. Photo-electric effect: photo current versus intensity and wavelength of light; maximum energy of photo-electrons versus frequency of light
3. To determine the Planck's constant using LEDs of at least 4 different colors.
4. To determine the ionization potential of mercury.
5. To determine the absorption lines in the rotational spectrum of Iodine vapour.
6. To determine the value of e/m by (a) Magnetic focusing or (b) Bar magnet.
7. To setup the Millikan oil drop apparatus and determine the charge of an electron.
8. To show the tunneling effect in tunnel diode using I-V characteristics.
9. To determine the wavelength of laser source using diffraction of single slit.
10. To determine the wavelength of laser source using diffraction of double slits.
11. To determine (1) wavelength and (2) angular spread of He-Ne laser using plane diffraction grating
12. To determine the value of e/m for electron by long solenoid method.
13. Photo Cell – Determination of Planck's constant.
14. To verify the inverse square law of radiation using a photo-electric cell.
15. To find the value of photo electric work function of a material of the cathode using a photo-electric cell.
16. Measurement of magnetic field – Hall probe method.
17. To determine the dead time of a given G.M. tube using double source.
18. Hydrogen spectrum – Determination of Rydberg's constant
19. Energy gap of intrinsic semi-conductor
20. G. M. Counter – Absorption coefficients of a material.
21. To draw the plateau curve for a Geiger Muller counter.
22. To find the half-life period of a given radioactive substance using a G.M. Counter.

Reference Books:

1. Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House
2. Advanced level Physics Practicals, Michael Nelson and Jon M. Ogborn, 4th Edition, reprinted 1985, Heinemann Educational Publishers
3. A Text Book of Practical Physics, I. Prakash & Ramakrishna, 11th Edn, 2011,Kitab Mahal

Note: Minimum of eight experiments should be performed.

B.Sc. (Physics) - III Year
Semester – V
Paper – V(B) : Computational Physics
(DSE-1: Elective)

Total: 56 hrs
(4 Hrs / week)

UNIT I: Programming in C (14 Hrs)
Flow charts, algorithms, Integer and floating-point arithmetic, precision, variable types, arithmetic statements, input and output statements, control statements, executable and non-executable statements, arrays, Repetitive and logical structures, Subroutines and functions, operation with files, operating systems, Creation of executable programs.

UNIT II: Numerical methods of Analysis (14 Hrs)
Solution of algebraic and transcendental equation, Newton Ramphan method, Solution of simultaneous linear equations. Matrix inversion method, Interpolation, Newton and Lagrange formulas, Numerical differentiation. Numerical integration, Trapezoidal, Simpson and gaussian quadrature methods, Least square curve fitting, Straight line and Polynomial fits.

UNIT III: Numerical solution of ordinary differential equations (14 Hrs)
Eulers and Runge kutta methods, simulation. Generation of uniformly distributed random integers, statistical tests of randomness. Monte-Carlo evaluation of integrals and error analysis, Non-uniform probability distributions, Importance sampling, Rejection method.

UNIT IV: Computational methods (14 Hrs)
Metropolis algoritham, Molecular diffusion and Brownian motions, Random walk problems and their Montecarlo simulation. Finite element and Finite difference methods. Boundary value and initial value problems, density functional methods.

Note: Problems should be solved at the end of every chapter of all units

Suggested Books:

1. Computational methods in Physics and Engineering: Wong
2. Computer Oriented Numerical methods: Rajaraman
3. Computer Programming in Fortran 77: Rajaraman
4. Applied Numerical Analysis: Gerald
5. A Guide to Manto - Carlo simulations Statistical Physics: Land

B.Sc. (Physics) – III year
Semester – V
Paper – V(B) : Computational Physics Practicals
(DSE-1: Elective)

1. Jacobi Method of Matrix diagonalization
2. Solution of Transcendental or Polynomial equations by the Newton Raphson method
3. Linear curve fitting and calculation of linear correlation coefficients
4. Matrix Simulation: Subtraction and Multiplication.
5. Matrix Inversion and solution of simultaneous equations
6. Lagrange interpolation based on given input data
7. Numerical integration using the Simpsons method.
8. Numerical integration using the Gaussian quadrature method.
9. Solution of first order Differential Equation using Runge-kutta method.
10. Numerical first order differentiation of a given function.
11. Fast Fourier transform
12. Monte Carlo Integration
13. Use of a package for data generation and graph plotting.
14. Test of Randomness for random numbers generators.

Note: Minimum of eight experiments should be performed. Maximum of 15 students per batch and maximum of three students per experiment should be allotted in the regular practical class of three hours per week.

B.Sc. (Physics) - III Year
Semester – VI
Paper – VI(A) : Electronics
(DSE-2: Elective)

Total: 56 hrs
(4 Hrs / week)

Unit - I: (14 Hrs)

1. Band theory of P-N junction: Energy band in solids (band theory), valence band, conduction band and forbidden energy gap in solids, insulators, semi conductors and pure or intrinsic semiconductors and impure or extrinsic semi-conductors. N-type semi-conductors, P-type semi-conductors, Fermi level, continuity equation.

2. Diodes: P-N junction diode, Half-wave, full-wave and bridge rectifier. Zener diode & its characteristics. Zener diode as voltage regulator.

Unit-II: (14 Hrs)

1. Bipolar Junction Transistor (BJT) – p-n-p and n-p-n transistors, current components in transistors, CB, CE and CC configurations – transistor as an amplifier -RC coupled amplifier – Frequency response (Qualitative analysis).

2. Feedback concept & Oscillators: Feedback, General theory of feedback–Concepts of oscillators, Barkhausen's criteria, Phase shift oscillator – Expression for frequency of oscillation.

Unit-III: (14 Hrs)

Special devices- Construction and Characteristics: Photo diode - Shockley diode -Solar cell, Opto-couplers - Field Effect Transistor (FET) - FET as an Amplifier - Uni Junction Transistor (UJT), UJT as a relaxation oscillator - Silicon controlled rectifier (SCR) - SCR as a switch.

Unit-IV: (14 Hrs)

1. Digital Electronics

Binary number system, conversion of binary to decimal and vice-versa. Binary addition and subtraction (1's and 2's complement methods).Hexadecimal number system. Conversion from binary to hexadecimal and vice-versa, Decimal to hexadecimal and vice-versa.

2. Logic gates:

OR, AND, NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate (EX-OR). De Morgan's Laws – Verification.

NOTE: Problems should be solved from every chapter of all units.

Suggested Books:

1. Electronic devices and circuits – Millman and Halkias. *Mc.Graw-Hill Education.*
2. Principles of Electronics by V.K. Mehta – *S. Chand & Co.*
3. Basic Electronics (Solid state) – B. L. Theraja, S. Chand & Co.
4. A First Course in Electronics- Anwar A. Khan & Kanchan K. Dey, PHI.
5. Physics of Semiconductor Devices- S. M. Sze
6. Physics of Semiconductors- Streetman.
7. Basic Electronics – Bernod Grob.
8. Basic Electronics for B.Sc (Physics) III Year, 2019, Telugu Academy
9. Digital Principles & Applications – A.P. Malvino and D.P. Leach

B.Sc. (Physics) – III year
Semester – VI
Paper-VI(A) : Electronics Practicals
(DSE-2: Elective)

1. Construction of logic gates (AND, OR, NOT, gates) with discrete components– Truth table Verification
2. AND, OR, NOT – gates constructions using universal gates – Verification of truth tables.
3. Constructionof NAND and NOR gates with discrete components and truth table verification
4. Characteristics of a Transistor in CE configuration
5. R.C. coupled amplifier – frequency response.
6. Verification of De Morgan's Theorem.
7. Zener diode V-I characteristics.
8. P-n junction diode V- I characteristics.
9. Zener diode as a voltage regulator
10. Construction of a model D.C. power supply
11. R C phase shift Oscillator –determination of output frequency

Note: Minimum of eight experiments should be performed.

Suggested Books:

1. B.Sc. Practical Physics – C. L. Arora – S. Chand & Co.
2. Viva-voce in Physics – R.C. Gupta, Pragathi Prakashan, Meerut.
3. Laboratory manual for Physics Course by B.P. Khandelwal.
4. Practical Physics by M. Arul Thakpathi by Comptex Publishers.
5. B.Sc. practical physics – Subbi Reddy.

B.Sc. (Physics)- III Year
Semester – VI
Paper – VI(B) : APPLED OPTICS
(DSE-2: Elective)

Total: 56 Hrs
(4 Hrs / week)

Unit I: Principles of LASER (14 Hrs)

Emission and absorption of Radiation, -Einstein Relations- Pumping Mechanism- optical feedback- Laser rate equation for two, three and Four level Lasers, pumping threshold condition- Principle of Lase beams. Classification of LASER Systems- Gas, Liquid and Solid Lasers He-Ne and Argon Lasers, their energy level schemes- Ruby Laser and YAG laser, GA-As Laser and their applications in various fields.

Unit II: Holography (14 Hrs)

Basic principle of Holography- Recording of amplitude and phase. The recording medium- reconstruction of original wave front- Image formation by wave front reconstruction- Gaber Hologram- limitations of Gaber Hologram-Fourier Transform Hologram-Volume Hologram- Applications of holograms.

Unit III: (14 Hrs)

Fourier and Non-Linear Optics: Thin lens as phase transformation-thickness function-various types of lenses- Fourier transforming properties of lenses-Object placed Infront of the lens- Object placed behind the lens.

Non-Linear Optics: harmonic generation- second hormonic generation-phase matching condition- Optical mixing- parametric generation of Light- Self focusing of light.

Unit IV: Optical Fibers (14 Hrs)

Fiber types and their structures.Ray optic representation, Acceptance angle and numerical aperture. Step index and graded index fibers. Sigle mode and multi-mode fibers. Fiber materials for glass fibers and plastic fibers. Signal attenuation in optical fibers. Absorption, Scattering and bending losses in fibers, core and cladding losses. Material dispersion, wave guide dispersion, intermodes distortion and pulse broadening.

Note:-Problems should be solved at the end of every chapter of all units

Suggested Books:

1. Opto electronics an Introduction-Wilson & JFB Hawkes 2nd edition
2. Introduction to Fourier optics-JW Goodman
3. Lasers and Non linear Optics--BB Laud
4. Optical electronics – Ghatak and Thyagarajan
5. Principles of Lasers- O.Svelto
6. Optical fiber communication -By Geradkeiser
7. Optical fiber communication-by John M Senior (PHI)

B.Sc. (Physics) – III year
Semester – VI
Paper – VI(B) : Applied Optics Practicals
(DSE-2: Elective)

1. Study of the Profile of a laser beam
2. Determination of the diameter of a thin wire using laser
3. Determination of wavelength of He-Ne laser by transmission grating
4. Construction and recording of a Hologram
5. Study of Fourier transforming properties of lenses
6. Study of second harmonic generation by KDP crystal
7. Measurement of numerical aperture of an optical fiber
8. Measurement of coupling losses in optical fiber
9. Measurement of bending losses in optical fiber
10. Study of audio signal transmission through optical fiber
11. To study the interference of light using optical fiber

Note: Minimum of eight experiments should be performed.

Suggested Books:

1. Introduction to fourier Optics- J Goodman
2. Optical Fiber Communication- John M senior
3. Principles of Lasers-by O.Svelto
4. Modern Optics by Grant Fowles
5. Principles of Optics by Born & Wolf
6. Fundamentals of Optics by Jekins & White

B.Sc. (Physics) - II Year
Semester – III
Experimental methods & Error analysis
(SEC - I)

Total: 28 Hrs
(2 Hrs / week)

Unit I: Experimental Methods (14 Hrs)

Least count of an instruments, Instruments for measuring mass, length, time, angle, current, voltage. Fundamental Units. Precession and accuracy of measurements, source of error in measurements, necessity of estimating errors, types of errors, reading error of instrument, Calibration error, random error, system error, Significant digits, order of magnitude and rounding of numbers, rounding error, absolute and relative error. Errors of computation- addition, subtraction, multiplication, division error in power and roots, propagation errors, analysis of data, standard deviation, calculation of mean value.

Unit II: I Statistical analysis of errors (14 Hrs)

Mean, mode and standard deviation, Standard deviation of mean, Least squares fitting, Normal distribution, covariance and correlation, Binomial distribution, passion distribution, chi-square test.

Note:-Problems should be solved at the end of every chapter of all units

Suggested Book:

1. The theory of errors in Physical Measurements JC Pal New central book agency -2010

B.Sc. (Physics) - II Year
Semester – III
Electrical circuit Networking
(SEC - II)

Total: 28 Hrs
(2 Hrs / week)

Unit I: (16 Hrs)

Basic electricity principles: Voltage, current, resistance and power – Ohm's law – Series, parallel and series-parallel combinations of resistances – AC electricity and DC electricity – Familiarization with multimeter, voltmeter and ammeter

Electrical circuits: Main electric circuit elements and their combination – Rules to analyze DC sourced electrical circuits – current and voltage drop across the DC circuit elements – single-phase and three-phase alternating current sources – Rules to analyze AC sourced electrical circuits – Real, imaginary and complex power components of AC source – Power factor – saving energy and money

Electrical drawing and symbols: Drawing symbols – Blueprints – Reading schematics – Ladder diagrams

Electrical schematics: Power circuits – Control circuits – Reading of circuit schematics – Tracking the connections of elements and identification of current flow and voltage drop

Generators and Transformers: DC power sources, AC/DC generators – Inductance, capacitance and impedance – Operation of transformers.

Electric motors: Single-phase, three phase & DC motors-Basic design – Interfacing DC or AC sources to control heaters and motors – Speed & power of AC motor

Solid state devices: Resistors, inductors and capacitors – Diode and rectifiers – Components in series or parallel – Response inductors and capacitors with DC or AC sources

Unit-II: (12 Hrs)

Electrical protection: Relays, fuses and disconnect switches – Circuit breakers – Overload devices – Ground-fault protection – Grounding and isolating – Phase reversal – Surge protection – Interfacing DC or AC sources to control elements (Relay protection device)

Electrical wiring: Different types of conductors and cables – Basics of wiring – Star and Delta connection – voltage drop and losses across cables and conductors – Instruments too measure current, voltage and power in DC and AC circuits – Insulation – Solid and stranded cable, conduit, cable trays – Splices: wire nuts, crimps, terminal blocks, split bolts and solder – Preparation of extension board.

Note: Problems should be solved at the end of every chapter of all units

Suggested Books:

1. A text book in electrical technology – B. L. Thereja – S. Chand & Co.
2. A text book of electrical technology – A. K. Thereja
3. Performance and design of AC machines – M. G. Say – ELBS Edn

B.Sc. (Physics)- II Year
Semester – IV
Basic Instrumentation
(SEC - III)

Total: 28 Hrs
(2 Hrs / week)

Unit I: (14 Hrs)

Basics of measurement: Instruments accuracy, precision, sensitivity, resolution, range, etc – Errors in measurements and loading effects – Multimeter: Principles of measurement of dc voltage and dc current, ac voltage and ac current, resistance – Specifications of a multimeter and their significance

Electronic voltmeter: Advantage over conventional multimeter for voltages measurement with respect to input impedance and sensitivity – Principles of voltage measurement (Block diagram only) – Specifications of an Electric voltmeter, multimeter and their significance - AC millivoltmeter: Types of AC millivoltmeters – Block diagram of AC millivoltmeter Amplifier-rectifier and Rectifier-amplifier – Specifications and their significance

Cathode Ray Oscilloscope (CRO): Block diagram of CRO – construction of CRT – electron gun – electrostatic focusing and acceleration (Qualitative only) – Brief description of screen phosphor, visual persistence and chemical composition – Time-base operation – synchronization – front panel controls – specifications of CRO and their significance – Use of CRO for the measurement of voltage dc and ac frequency, time period – Special features of dual trace – Introduction to digital oscilloscope – Probes – Digital storage oscilloscope: Block diagram and principle of working

Unit II: (14 Hrs)

Signal generators and Analysis instruments: Block diagram, explanation and specifications of low frequency signal generator, pulse generator and function generator – Concept of testing – Specifications – Distortion factor meter – wave analysis.

Impedance Bridges & Q-meters: Block diagram of bridge – working principles of basic (balancing type) RLC bridge – Specifications of RLC bridge – Block diagram & working principles of a Q-meter – Digital LCR bridges

Digital Instruments: Principle and working of digital meters – Comparison of analog & digital instruments – characteristics of digital meter – working principles of digital voltmeter.

Digital multimeter: Block diagram and working of digital multimeter – working principle - time interval, frequency and period measurement using universal counter/frequency counter – time-base stability, accuracy and resolution.

Note: *Problems should be solved at the end of every chapter of all units.*

Suggested Books:

1. A text book in electrical technology – B. L. Thereja – S. Chand & Co.
2. Performance and design of AC machines – M. G. Say – ELBS Edn
3. Digital circuits and systems – Venugopal, Tata McGraw Hill, 2011
4. Logic circuit design – Shimon P. Vingron, Springer, 2012
5. Digital electronics – Subrata Ghoshal, Cengage Learning, 2012
6. Electronic devices and circuits – S. Salivahanan & N. S. Kumar, 3rd Edn, 2012, Tata McGraw Hill
7. Electronic circuits: Hand Book of design and applications – U. Tietze & Ch. Schenk, Springer, 2012
8. Electronic devices – Thomas L. Floyd, 7th Edn., Pearson India, 2008

B.Sc. (Physics) - II Year
Semester – IV
Digital Electronics
(SEC - IV)

Total: 28 Hrs
(2 Hrs / week)

Unit I (14 Hrs)

Number Systems: Decimal, Binary, Octal and Hexadecimal.
Conversion: Binary to Decimal, Octal to Decimal, Hexadecimal to Decimal, Decimal to Binary, Decimal to Octal and Decimal to Hexadecimal.
Binary coded decimal, Excess-3 code, grey code, ASCII code.
Logic gates: OR, AND, NOT, EX-OR, NAND, NOR, Universal gates.
Half adder and Full adder.

Unit II: (14 Hrs)

Boolean algebra: Boolean laws, DeMorgan's theorems, Sum of products, Product of sums and Karnaugh maps. Multiplexers and Demultiplexers.
Flip-Flops: RS flip-flop, D flip-flop, JK flip-flop and MS flip-flop.
Registers: Types of Registers.
Counters: Synchronous and Asynchronous counters and their differences.

NOTE: Problems should be solved at the end of every chapter of all units.

References:

1. Digital Electronics by Gothman
2. Digital principles and applications by Malvino and Leach

Suggested Books:

1. Electronic Devices and circuits - Jacob Milliman, Christos C. Haikais and satyabrata Jit, Mc Graw Hill (India) Pvt. Ltd, 2010
2. Op-Amps and Linear Integrated circuits – P. Ramakanth and Gaykward, 4th edition PHI, 2000
3. Electronic measurements and instrumentation Technology - William D cooper and Ad Helfrick, PHI, 2002
4. Electronic devices and circuits – S. Shalivahan and N. Sureshkumar 2nd Edn, Mc Graw Hill, Pvt. Ltd., 2007.
5. Basic Electronics for B.Sc (Physics) III Year, 2019, Telugu Academy

B.Sc. (Physics)- III Year
Semester – V
Renewal energy & Energy harvesting
(GE)

Total: 56 Hrs
(4 Hrs / week)

Unit I: Principles of Solar Radiation and Collection (Qualitative only) (14Hrs)

Non-renewable energy resources – Principles of power generation and transmission. A model of conventional thermal power plant. Advantages and disadvantages of conventional power plants. Role and potential of new and renewable sources, the solar energy option, environmental impact of solar power, physics of the sun, the solar constant, solar radiation on tilted surface, instruments for measuring solar radiation and sun shine, solar radiation data.

Unit II: Solar Energy Storage and Applications (14Hrs)

Solar energy collectors - Flat plate and concentration collectors, classification of concentration collectors and orientation, advanced collectors. Different sensible, latent heat and stratified storage, solar ponds. Solar Applications – solar heating/ cooling technique, solar distillation and drying, photovoltaic energy conversion.

Unit III: Wind and Bio-Mass Energy (14Hrs)

Resources and potentials, horizontal and vertical axis windmills, performance characteristics. Principles of Bio-Conversion, Energy from waste, types of bio-gas digesters, gas yield, combustion characteristics of bio-gas, utilization for cooking, LPG and CNG.

Unit IV: Geothermal and Ocean Energy (14Hrs)

Resources, types of wells, methods of harnessing the energy, potential in India. OTEC, principles of utilization, setting of OTEC plants, thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, mini-hydel power plants, land and their economics.

Suggested Books:

1. Non-Conventional Energy Sources - G.D Rai, Khanna Publishers
2. Renewable Energy Resources - Twidell & Wier, CRC Press (Taylor & Francis)
3. Renewable energy resources - Tiwari and Ghosal, Narosa.
4. Renewable Energy Technologies - Ramesh & Kumar, Narosa
5. Non-Conventional Energy Systems - K Mittal, Wheeler
6. Renewable energy sources and emerging technologies - D.P. Kothari, K.C. Singhal.

B.Sc. (Physics)- III Year
Semester – VI
Nano Science
(Paper in lieu of project)

Total: 56 Hrs
(4 Hrs / week)

Unit I: (12 Hrs)

Length scales in physics and Nano structures: 1D, 2D and 3D nano structures (nanodots, thin films, nanowires, nanorods), Band structure and density of states of materials at nano scale – Size effects in nano systems – Quantum confinement in 3D, 2D and 1D nano structures and its consequences

Unit II: (16 Hrs)

Synthesis of Nano structure materials: Top-down and Bottom-up approach – Photolithography – Ball milling – Gas phase condensation – Vacuum deposition – Physical vapor deposition (PVD) – Thermal evaporation – E-beam evaporation – Pulsed Laser deposition – Chemical vapor deposition (CVD) – Sol-Gel – Electro deposition – Spray pyrolysis – Hydrothermal synthesis – Preparation through colloidal methods – MBE growth of quantum dots

Characterization: X-Ray diffraction – Optical microscopy – Scanning Electron Microscope (SEM) – Transmission Electron Microscope (TEM) – Atomic Force Microscope (AFM) – Scanning Tunneling Microscope

Unit III: (14 Hrs)

Optical properties: Coulomb interaction in nano structures – concept of dielectric constant for nano structures and charging of nano structure – Quasi-particles and excitons – Excitons in direct and indirect band gap semiconductor nanocrystals – Quantitative treatment of quasi-particles and excitons – Charging effects – Radiative processes: general formalization – absorption, emission and luminescence – Optical properties of hetero structures and nano structures

Electron Transport: Carrier transport in nano structures – Coulomb blockade effect – thermionic emission – tunneling and hoping conductivity – Defects and impurities: Deep level and surface defects

Unit IV: (14 Hrs)

Applications: Applications of nano particles, quantum dots, nanowires and thin films for photonic devices (LED, solar cells) – Single electron devices (Qualitative only) – CNT based transistors – Nano material devices: Quantum dots – hetero structure Lasers

Optical switching and optical data storage – Magnetic quantum well – magnetic dots – magnetic data storage – Micro Electromechanical Systems (MEMS), Nano Electromechanical Systems (NEMS)

Suggested Books:

1. Introduction to Nanotechnology – C.P. Poole, Jr. Frank, J. Owens – Wiley India Pvt, Ltd.
2. Nanotechnology: Principles & Practices – S.K. Kulkarni – Capital Publishing Co.)
3. Introduction to Nanoscience and Technology – K.K. Chatopadhyay, A.N. Benerjee – PHI Learning Pvt. Ltd.
4. Nanotechnology – Richard Booker, Earl Boysen – John Wiley and Sons
5. Nanoparticle Technology Handbook – M. Hosokawa, K. Nogi, M. Naita, T. Yokoyama, Elsevier, 2007.
6. Springer Handbook of Nanotechnology – Bharath Bhushan, Springer-Verlag, Berlin, 2004.

SCHEME OF QUESTION PAPER

B.Sc. (PHYSICS) I/II/III Year Examination
Semester: I/II/III/IV/V/VI
Paper:
(For DSC, DSE, GE & Paper in lieu of project)

Time: 3 Hours] **[Marks: 80**

SECTION A: SHORT ANSWER QUESTIONS (8 X 4 = 32)

Answer Any EIGHT questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)
7. From Unit 3
8. From Unit 3
9. From Unit 3 (Problem)
10. From Unit 4
11. From Unit 4
12. From Unit 4 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (4 X 12 = 48)

Answer Any FOUR questions. All questions carry equal marks

13. (a) From Unit 1

    OR

    (b) From Unit 1

14. (a) From Unit 2

    OR

    (b) From Unit 2

15. (a) From Unit 3

    OR

    (b) From Unit 3

16. (a) From Unit 4

    OR

    (b) From Unit 4

SCHEME OF QUESTION PAPER

B.Sc. (PHYSICS) II Year Examination
Semester: III/IV
Paper:
(For SEC)

Time: 2 Hours] **[Marks: 40**

SECTION A: SHORT ANSWER QUESTIONS (4 X 4 = 16)

Answer Any FOUR questions. Each question carries equal marks

1. From Unit 1
2. From Unit 1
3. From Unit 1 (Problem)
4. From Unit 2
5. From Unit 2
6. From Unit 2 (Problem)

SECTION B: ESSAY TYPE ANSWER QUESTIONS (2 X 12 = 24)

Answer Any TWO questions. All questions carry equal marks

7. (a) From Unit 1

   OR

   (b) From Unit 1

8. (a) From Unit 2

   OR

   (b) From Unit 2