

**GOVT. DEGREE & PG COLLEGE (AUTONOMOUS): SIDDIPET.  
CHOICE BASED CREDIT SYSTEM (CBCS) 2017-18**

**COURSE: B.Sc.**

**SUBJECT: PHYSICS**

<b>SEM</b>	<b>PAPER</b>	<b>LEVEL</b>	<b>MODULE(PAPER)&amp; CONTENT</b>	<b>NO.OF HOURS/ WEEKS</b>	<b>MAX MARKS</b>	<b>CREDITS</b>
I	I	CORE	Mechanics	4	100	4
I	PRACTICALS - I		Mechanics Practicals	3	50	1
II	II	CORE	Waves & Oscillations	4	100	4
II	PRACTICALS - II		Waves & oscillation Practicals	3	50	1
III	III	CORE	Thermal Physics	4	100	4
III	PRACTICALS - III		Thermal Physics Practicals	3	50	1
IV	IV	CORE	Optics	4	100	4
IV	PRACTICALS - IV		Optics Practicals	3	50	1
V	V	ADVANCED	Electromagnetic Theory	3	100	3
	PRACTICALS - V		Electromagnetic Theory Practicals	2	50	1
	VI	APPLIED	Atomic Spectra & Quantum Mechanics	3	100	3
	PRACTICALS - VI		Practicals	2	50	1
VI	VII	ADVANCED	Basic Electronics	3	100	3
	PRACTICALS - VII		Practicals	2	50	1
	VIII	APPLIED	Nuclear Physics & Solid State Physics	3	100	3
	PRACTICALS - VIII		Practicals	2	50	1
<b>TOTAL CREDITS</b>						<b>36</b>

**GOVT. DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc I year Semester-I**  
**Paper-I : Mechanics** **(48 hours)**

**UNIT- I**

**1. Vector Analysis** **(12h)**

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 and Green's theorems- simple applications.

**UNIT- II**

**2. Mechanics of particles(12)** **(7h)**

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, Rutherford scattering

**3. Mechanics of rigid bodies** **(5h)**

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

**UNIT- III**

**4. Central forces** **(12h)**

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

**UNIT- IV**

**5. Special theory of relativity** **(12h)**

Galilean relativity, absolute frames, Michelson-Morley experiment, Postulates of special theory of relativity. Lorentz transformation, time dilation, length contraction, addition of velocities, position and velocity as four vectors, four momentum, mass-energy relation.

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

## **Text books.**

1. Fundamentals of Physics. Halliday, Resnick and Walker Wiley India Edition 2007.
2. First Year Physics - Telugu Academy.
3. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
4. Unified Physics Volume-I, S.L. Gupta & Sanjeev Gupta. Jai Prakash Nath & Company.

## **Reference Books**

1. Fundamentals of Physics by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.
2. University Physics by Young and Freeman, Pearson Education, Edition 2005.
3. An introduction to Mechanics by Daniel Kleppner & Robert Kolenkow. The McGraw Hill Companies.
4. Engineering Physics. R.K. Gaur & S.L. Gupta. Dhanpat Rai Publications.
5. Classical mechanics by J.C. Upadhyaya
6. The Feynman Lectures in physics Volume-I, B.I Publications

# List of practicals

**B.Sc- I yr sem-I**

**Paper-I**

**36 hours (3 hrs /week)**

1. Measurement of errors – Simple Pendulum
2. Study of Oscillations under Bifilar suspension.
3. Verification of perpendicular axis theorem by using bifilar suspension.
4. Study of oscillations of a mass under different combination of springs.
5. 'Y' by uniform Bending.
6. 'Y' by Non-uniform Bending.
7. Moment of Inertia of a fly wheel.
8. Determination of frequency of a Tuning fork - Melde's experiment
9. Study of damping of an oscillating disc in Air and Water logarithmic decrement.
10. Calculation of slope and intercept of a  $Y=mX + C$  by theoretical method.

## **PRACTICAL EXAMINATION SCHEME OF EVALUATION ( MAX.MARKS : 50)**

a. Record	05
b .Apparatus, Formula + Tabular form + Model graph	08
c .Procedure	07
d .Observations & Graph	12
e .Precautions	03
f .Calculations + Results & Units	10
g. Viva-Voce	05
<b>Total</b>	<b>50</b>

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc I year Semester-II**  
**Paper-II : Waves and Oscillations (48 hours)**

**UNIT- I**

**1.Fundamentals of vibrations (12h)**

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

**UNIT- II**

**2. Damped and forced oscillations (12h)**

Damped harmonic oscillator, solution of the differential equation of damped oscillator. Energy considerations, comparison with undamped harmonic oscillator, logarithmic decrement, relaxation time, quality factor, differential equation of forced oscillator and its solution, amplitude resonance, velocity resonance, coupled oscillators

**UNIT- III**

**3. Vibrating strings (12h)**

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

Complex vibrations : Fourier  
theorem and evaluation of the Fourier coefficients, analysis of periodic wave functions-square wave

**UNIT- IV**

**4. Vibrations of bars (12h)**

Longitudinal vibrations in bars- wave equation and its general solution. Special cases (i) bar fixed at both ends ii) bar fixed at the mid point 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.

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

### **Text books.**

1. Waves and Oscillations. S. Badami, V. Balasubramanian and K. Rama Reddy Orient Longman.
2. First Year Physics - Telugu Academy.
3. Unified Physics Volume-I, S.L.Gupta & Sanjeev Gupta. Jai Prakash Nath & Company.
4. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
5. Waves and Oscillations. N. Subramaniam and Brijlal Vikas Publishing House Private Limited.

### **Reference Books**

1. Fundamentals of Physics by Alan Giambattista et al Tata-McGraw Hill Company Edition, 2008.
2. University Physics by Young and Freeman, Pearson Education, Edition 2005.
3. Sears and Zemansky's University Physics by Hugh D. Young, Roger A. Freedman Pearson Education Eleventh Edition.
4. Engineering Physics. R.K. Gaur & S.L. Gupta. Dhanpat Rai Publications.

# List of practicals

## B.Sc- I yr sem-II

### Paper-II

36 hours (3 hrs /week)

1. Study of a compound pendulum determination of 'g' and 'k'.
2. Observation of Lissajous figures from CRO.
3. Study of flow of liquids through capillaries.
4. Determination of Surface Tension of a liquid by different methods.
5. Study of Viscosity of a fluid by different methods.
6. Volume Resonator –determination of frequency of a tuning fork.
7. Verification of Laws of a stretched string (Three Laws) - Sonometer
8. 'n' by torsion pendulum
9. Study of damping of a bar pendulum.
10. Velocity of transverse wave along a stretched string .

### Text and reference books

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

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc II year Semester-III**  
**Paper – III : Thermodynamics** ( 48 hrs)

**Unit – I**

**1. Kinetic theory of gases: (5)**

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

**2. Thermodynamics: (7)**

Basics of thermodynamics-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: (6)**

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: (6)**

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: (12)**

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 distribution 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: (12)**

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, Application of B-E distribution to Photons-planks radiation formula, Application of Fermi-Dirac statistics to white dwarfs and Neutron stars.

#### **Textbooks**

1. **Fundamentals of Physics.** Halliday/Resnick/Walker.C. *Wiley India Edition 2007.*
2. **Second Year Physics – Telugu Academy.**
3. **Modern Physics** by R. Murugesan and Kiruthiga Siva Prasath (for statistical Mechanics) *S. Chand & Co.*
4. **Heat and Thermodynamics** by Mark W.Zemansky 5<sup>th</sup> edition Mc Graw - Hill
5. **Heat and Thermodynamics** by D.S. Mathur.
6. **Unified Physics Volume-II,** S.L.Gupta & Sanjeev Gupta. Jai Prakash Nath & Company.

#### **Reference Books**

1. **Modern Physics** by G. Aruldas and P. Rajagopal, *Eastern Economy Education.*
2. Berkeley Physics Course. Volume-5. **Statistical Physics** by F. Reif. *The McGraw-Hill Companies.*
3. **An Introduction to Thermal Physics** by Daniel V. Schroeder. *Pearson Education Low Price Edition.*
4. **Thermodynamics** by R.C. Srivastava, Subit K. Saha&Abhay K. *Jain Eastern Economy Edition.*
5. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand& Co. Publications.*
6. **Feynman's Lectures on Physics** Vol. 1,2,3& 4. *Narosa Publications.*
7. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
8. B.B. Laud "Introduction to statistics Mechanics"(Macmillan 1981)
9. F.Reif: "Statistical Physics "(Mcgraw-Hill,1998)
- 10.K.Haung: "Statistical Physics "(Wiley Eastern 1988) 11

# List of practicals

## B.Sc- II yr sem-III

### Paper-III

36 hours (3 hrs /week)

### Thermodynamics

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. Determination of Thermo emf
6. Cooling Curve of a metallic body (Null method)
7. Resistance thermometer. To Determine temp coeff resistance
8. Thermal expansion of solids
9. Study of mechanical energy to heat.
10. Determine the Specific of a solid (graphite rod )
11. Thermistor Characteristics. Calculation of A and B

**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.

### Text and reference books

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

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc II year Semester-IV**  
**Paper – IV : Optics** ( 48 hrs)

**Unit I:**

**1 Interference: (12)**

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<sub>1</sub>, D<sub>2</sub> lines and thickness of a thin transparent plate.

**Unit II:**

**2 Diffraction: (12)**

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. 13

### **Unit III:**

#### **3 Polarization (12)**

Polarized light : Methods of Polarization, Polarization by reflection, refraction, Double refraction, selective absorption , scattering of light – Brewsters 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.

### **Unit IV:**

#### **4 Aberrations and Fiber Optics : (12)**

Introduction – Monochromatic aberrations, spherical aberration, methods of minimizing spherical aberration, coma, astigmatism and curvature of field, distortion. Chromatic aberration – the achromatic doublet – Removal of chromatic aberration of a separated doublet.

Fiber Optics : Introduction – Optical fibers – Principles of fiber communication – Step and graded index fibers – Rays and modes in an optical fiber – Fiber material – Types of optical fibers and advantages of fiber communication.

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

#### **Textbooks**

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. Murugesan and Kiruthiga Siva Prasath. *S. Chand & Co.*
5. **Second Year Physics – Telugu Academy.**
6. **Unified Physics** Volume-II, S.L.Gupta & Sanjeev Gupta. *Jai Prakash Nath & Company.*

#### **Reference Books**

1. **Modern Engineering Physics** by A.S. Vasudeva. *S.Chand & Co. Publications.*
2. **Feynman’s Lectures on Physics** Vol. 1,2,3& 4. *Narosa Publications.*
3. **Fundamentals of Optics** by Jenkins A. Francis and White E. Harvey, *McGraw Hill Inc.*
4. K. Ghatak, **Physical Optics’**
5. D.P. Khandelwal, **“Optical and Atomic Physics”** (Himalaya Publishing House, Bombay,1988)
6. Jenkins and White: **“Fundamental of Optics”** (McGraw-Hill)
7. Smith and Thomson: **“Optics”** (John Wiley and sons)

# List of practicals

**B.Sc- II yr sem-IV**

**Paper-IV**

**36 hours (3 hrs /week)**

## **Optics**

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.

**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.

## **Text and reference 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, AnchalSrivastava

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc III year Semester-V**  
**Paper-V : Electricity & Magnetism (45 hours)**

**Unit – I**

**1. Electrostatics**

**(10h)**

Gauss law and its applications-Uniformly charged sphere, charged cylindrical conductor and an infinite conducting sheet of charge. Deduction of Coulomb's law from Gauss law, Mechanical force on a charged conductor, Electric potential –Potential due to a charged spherical conductor, electric field strength from the electric dipole and an infinite line of charge. Potential of a uniformly charged circular disc.

**Unit – II**

**2. Dielectrics**

**(5h)**

An atomic view of dielectrics, potential energy of a dipole in an electric field. Polarization and charge density, Gauss's law for dielectric medium– Relation between D,E, and P. Dielectric constant, susceptibility and relation between them. Boundary conditions at the dielectric surface. Electric fields in cavities of a dielectric-needle shaped cavity and disc shaped cavity.

**3. Capacitance**

**(7h)**

Capacitance of concentric spheres and cylindrical condenser, capacitance of parallel plate condenser with and without dielectric. Electric energy stored in a charged condenser – force between plates of condenser, construction and working of attracted disc electrometer, measurement of dielectric constant and potential difference.

**Unit – III**

**4. Magnetostatics**

**(6h)**

Magnetic shell – potential due to magnetic shell – field due to magnetic shell – equivalent of electric circuit and magnetic shell – Magnetic induction (B) and field (H) – permeability and susceptibility – Hysteresis loop.

**5. Moving charge in electric and magnetic field**

**(7h)**

Motion of charged particles in electric and magnetic fields. Hall effect, cyclotron, synchrocyclotron and synchrotron – force on a current carrying conductor placed in a magnetic field, force and torque on a current loop, Biot –Savart's law and calculation of B due to long straight wire, a circular current loop and solenoid.

## Unit – IV

### 6. Electromagnetic induction

(10h)

Faraday's law – Lenz's law – expression for induced emf – time varying magnetic fields – Betatron – Ballistic galvanometer – theory – damping correction – self and mutual inductance, coefficient of coupling, calculation of self inductance of a long solenoid – toroid – energy stored in magnetic field – transformer – Construction, working, energy losses and efficiency.

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

### Textbooks

1. **Electricity and Magnetism** – D.N. Vasudeva. *S. Chand & Co.*
2. **Electricity and Magnetism** Brijlal and Subramanyam. *Ratan Prakashan Mandir.*
3. **Third year Physics** – *Telugu Akademy*
4. **Unified Physics** Volume-III, S.L. Gupta & Sanjeev Gupta. *Jai Prakash Nath & Company.*

### Reference Books

1. **Electricity and Magnetism** – C.J. Smith. *Edward Arnold Ltd.*
2. **Electricity, Magnetism with Electronics** – K K Tewari. *R. Chand & Co.*

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc III year Semester-V**  
**Paper-VI : Atomic spectra & Quantum mechanics (45hours)**

**Unit – I**

**1.Atomic Spectra (14h)**

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. Alkaline earth spectra, singlet and triplet fine structure. Zeeman Effect, Paschen-Back Effect and Stark Effect (basic idea).

**Unit – II**

**2.Molecular Spectroscopy (8h)**

Types of molecular spectra, pure rotational energies and spectrum of diatomic molecule, determination of internuclear distance. Vibrational energies and spectrum of diatomic molecule. Raman effect, Classical theory of Raman effect. Experimental arrangement for Raman effect and its applications.

**Unit – III**

**3.Introduction to Quantum Mechanics (10h)**

Spectral radiation – Planck’s law. Photoelectric effect – Einstein’s photoelectric equation. Compton’s effect (quantitative) experimental verification. Stability of an atom – Bohr’s atomic theory. Limitations of old quantum theory.

**Matter Waves:** 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 Broglie waves of electron in Bohr orbits.

**4.Uncertainty Principle (5h)**

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. Particle in a box. Complementary principle of Bohr.

**Unit – IV**

**Applications of Quantum Mechanics (8h)**

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. Application of Schrodinger wave equation to particle in one and three dimensional boxes, potential step and potential barrier.

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



## **Textbooks**

1. **Concepts of Modern Physics** by Arthur Beiser. *Tata McGraw-Hill Edition.*
2. **Modern Physics** by R. Murugesan and Kiruthiga Siva Prasath. *S. Chand & Co.*
3. **Spectroscopy –Atomic and Molecular** by Gurdeep R Chatwal and Shyam Anand – *Himalaya Publishing House.*
4. **Third Year Physics** - *Telugu Academy.*
5. **Unified Physics** Volume-IV, S.L.Gupta & Sanjeev Gupta. Jai Prakash Nath & Company.

## **Reference Books**

1. **University Physics with Modern Physics** by Young & Freedman. *A. Lewis Ford. Low Price Edition (Eleventh Edition).*
2. **Quantum Physics** by Eyvind H. Wichman. Volume.4. *The McGraw-Hill Companies.*
3. **Quantum Mechanics** by Mahesh C. Jani. *Eastern Economy Edition.*

# **List of practicals**

## **B.Sc- III yr sem-V**

### **Paper-V**

1. Carey Foster's Bridge – comparison of resistances.
2. Internal resistance of a cell by potentiometer.
3. Figure of merit of a moving coil galvanometer.
4. Voltage sensitivity of a moving coil galvanometer.
5. Verification of Kirchoff's laws.
6. Design and construction of multimeter.
7. Determination of ac-frequency-sonometer.

### **Paper-VI**

1.  $e/m$  of an electron by Thomson method.
2. Temperature characteristics of thermistor
3. R.C. coupled amplifier
4. Phase shift Oscillator
5. Determination of Planck's constant (photocell)
6. Characteristics of 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

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc III year Semester-VI**  
**Paper-VII : Electrodynamics & Electronics (45 hours)**

**Unit – I**

**1. Maxwell's equations and electromagnetic waves (10h)**

A review of basic laws of electricity and magnetism – displacement current – Maxwell's equations in differential form – Maxwell's wave equation, plane electromagnetic waves – Transverse nature of electromagnetic waves, Poynting theorem, production of electromagnetic waves (Hertz experiment)

**Unit – II**

**2. Varying and alternating currents (10h)**

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).

**Unit – III**

**3. Basic Electronics (8h)**

Formation of energy bands in solids, classification of solids in terms of forbidden energy gap. Intrinsic and extrinsic semiconductors, Fermi level, continuity equation – p-n junction diode, half wave and full wave rectifiers and filters, ripple factor (quantitative), Characteristics of Zener diode and its application as voltage regulator.

**4. Transistors (8h)**

p n p and n p n transistors, current components in transistors, CB,CE and CC configurations – concept of transistor biasing, operating point, fixed bias and self bias (Qualitative only), transistor as an amplifier — concept of negative feed back and positive feed back – Barkhausen criterion, RC coupled amplifier and phase shift oscillator (qualitative).

**Unit – IV**

**5. Digital Principles (4h)**

Binary number system, converting 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 – vice versa and Decimal to Hexadecimal vice versa.

**6. Logic gates (5h)**

OR,AND,NOT gates, truth tables, realization of these gates using discrete components. NAND, NOR as universal gates, Exclusive – OR gate, De Morgan's Laws – statement and proof, Half and Full adders. Parallel adder circuits.

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

### **Textbooks**

1. **Modern Physics** by R. Murugesan and Kiruthiga Siva Prasath – *S. Chand & Co.* for semi conductor & Digital Principles)
2. **Electricity and Magnetism** – D.N. Vasudeva. *S. Chand & Co.*
3. **Electronic devices and circuits** – Millman and Halkias. *Mc.Graw-Hill Education.*
4. **Third year Physics** – *Telugu Akademy*
5. **Unified Physics** Volume-III, S.L. Gupta & Sanjeev Gupta. Jai Prakash Nath & Company.

### **Reference Books**

1. **Electricity and Electronics** – D.C. Tayal. *Himalaya Publishing House.*
2. **Electricity and Magnetism** – C.J. Smith. *Edward Arnold Ltd.*
3. **Electricity, Magnetism with Electronics** – K K Tewari. *R.Chand & Co.*
4. **Principles of E4. Digital Principles and Applications** by A.P. Malvino and D.P. Leach. *McGrawHill Education.*
5. **Principles of Electronics** by V.K. Mehta – *S. Chand & Co..*

**GOVT.DEGREE COLLEGE (AUTONOMOUS)-SIDDIPET, DIST:MEDAK**  
**DEPARTMENT OF PHYSICS**  
**B.Sc III year Semester-VI**  
**Paper-VIII :Nuclear physics & Solid state physics (45 hours)**

**Unit – I**

**1.Nuclear Structure: (5h)**

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

**2.Nuclear Detectors: (5h)**

GM counter, proportional counter, scintillation counter, Wilson cloud chamber and solid state detector

**Unit – II**

**3.Alpha and Beta Decays: (5h)**

Range of alpha particles, Geiger – Nuttall law.

Gammow's theory of alpha decay. Geiger – Nuttall law from Gammow's theory.

Beta spectrum – neutrino hypothesis, Fermi's theory of beta-decay (qualitative).

**4.Nuclear Reactions: (3h)**

Types of nuclear reactions, channels, nuclear reaction kinematics. Compound nucleus, direct reactions (concepts).

**Unit – III**

**5.Crystal Structure: (7h)**

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

**X-ray Diffraction:**

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

**6.Bonding in Crystals: (5h)**

Types of bonding in crystals – characteristics of crystals with different bindings.

Lattice energy of ionic crystals – determination of Madelung constant for NaCl crystal, calculation of Born coefficient and repulsive exponent.

Born – Haber cycle.

**Unit – IV**

**7.Magnetism: (5h)**

Magnetic properties of dia, para and ferromagnetic materials.

Langevin's theory of paramagnetism. Weiss' theory of ferromagnetism –

Concepts of magnetic domains, antiferromagnetism and ferrimagnetism ferrites and their applications.

### **8.Superconductivity:**

**(10h)**

Basic experimental facts – zero resistance, effect of magnetic field, Meissner effect, persistent current, Isotope effect Thermodynamic properties, specific heat, entropy. Type I and Type II superconductors. Elements of BCS theory-Cooper pairs. Applications. High temperature superconductors (general information)

**Nanomaterials:** Introduction, nanoparticles, metal nanoclusters, semiconductor nanoparticles, carbon clusters, carbon nanotubes, quantum nanostructures – nanodot, nanowire and quantum well.

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

### **Textbooks**

1. **Modern Physics** by G. Aruldas & P. Rajagopal. *Eastern Economy Edition.*
2. **Concepts of Modern Physics** by Arthur Beiser. *Tata McGraw-Hill Edition..*
3. **Nuclear Physics** by D.C. Tayal, *Himalaya Publishing House.*
4. **Third Year Physics** - *Telugu Academy.*
5. **Unified Physics** Volume-IV, S.L.Gupta & Sanjeev Gupta. Jai Prakash Nath & Company.

### **Reference Books**

1. **Nuclear Physics** Irving Kaplan – *Narosa Publishing House.*
2. **Introduction to Solid State Physics** by Charles Kittel. *John Wiley and Sons.*
3. **Solid State Physics** by A.J. Dekker. *Mac Millan India*
4. **Nuclear Physics** by S.B.Patel. *Himalaya Publishing House.*

# List of practicals

## B.Sc- III yr sem-VI

### Paper-VII

1. Determination of time constant using RC .
2. LCR circuit series/parallel resonance – Q factor
3. Power factor of an A.C. circuit
4. Determination of Ripple factor –Half wave. Full wave and Bridge rectifier.
5. Determination of Ripple factor – L Section filter,  $\pi$  section filters.
6. Characteristics of a Junction diode
7. Characteristics of Transistor
8. Characteristics of Zener diode

### Paper-VIII

1. Energy gap of semiconductor using a junction diode
2. Verification of Logic gates AND, OR NOT, X-OR gates (Using discrete componenets)
3. Verification of De Morgan's theorems
4. Construction and verification of truth tables for half and full adders.
5. Hysteresis curve of transformer core
6. Study of absorption of beta and  $\gamma$  rays using G M Counter.
7. Hall-probe method for measurement of magnetic field.
8. Determination of Magnetic susceptibility – Capillary rise method.
9. Study of alkaline earth spectra using a concave grating.

### **Text Books for LAB**

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
6. **Basic electronics** -Grob
7. **Practical Electronics** -Zbar