S.K.R. & S.K.R. Govt. College for Women (Autonomous), Kadapa.
Reaccredited with 'B' Grade by NAAC
Y.S.R.Kadapa District – 516001, Andhra Pradesh

DEPARTMENT OF PHYSICS

B.Sc. 2nd year 4th Semester Physics Syllabus

PAPER-IV: ELECTRICITY, MAGNETISM AND ELECTRONICS

Work load: 60 hrs per semester **4 hrs/week**

UNIT-I: Kinetic Theory of gases: **(12 hrs)**

Kinetic Theory of gases-Introduction, Maxwell's law of distribution of molecular velocities
(qualitative treatment only) and its experimental verification, Mean free path, Degrees of freedom, Principle of equipartition of energy (Qualitative ideas only), Transport phenomenon in ideal gases: viscosity, Thermal conductivity and diffusion of gases.

UNIT-II: Thermodynamics: **(12hrs)**

Introduction- Isothermal and Adiabatic processes, Reversible and irreversible processes, Carnot's engine and its efficiency, Carnot's theorem, Second law of thermodynamics: Kelvin's and Clausius statements, Entropy, Physical significance, Change in entropy in reversible and irreversible processes; Entropy and disorder-Entropy of Universe; Temperature-Entropy (T-S) diagram and its uses.

UNIT-III: Thermodynamic Potentials and Maxwell's equations: **(12hrs)**

Thermodynamic potentials-Internal Energy, Enthalpy, Helmholtz Free Energy, Gibb's Free
Energy and their significance, Derivation of Maxwell's thermodynamic relations from thermodynamic potentials, Applications to (i) Clausius-Clayperon's equation (ii) Value of CPCV (iii) Value of CP/CV (iv) Joule-Kelvin coefficient for ideal gas.

UNIT-IV: Low temperature Physics: **(12hrs)**

Methods for producing very low temperatures, Joule Kelvin effect, Porous plug experiment , Joule expansion, Distinction between adiabatic and Joule Thomson expansion, Liquefaction of air by Linde's method, Production of low temperatures by adiabatic demagnetization (qualitative), Practical applications of Substances at low temperatures.

UNIT-V: Quantum theory of radiation: **(12 hrs)**

Blackbody and its spectral energy distribution of black body radiation, Kirchoff's law, Wein's
displacement law, Stefan-Boltzmann's law and Rayleigh-Jean's law (No derivations), Planck's law of black body radiation-Derivation, Solar constant and its determination using Angstrom pyroheliometer, Estimation of surface temperature of Sun.

Reference Books:

1. B. Sc. Physics, Vol.2, Telugu Academy, Hyderabad

2. Fundamentals of Physics Vol. I - Resnick, Halliday, Krane ,Wiley India 2007
3. Thermodynamics, R.C.Srivastava, S.K.Saha&AbhayK.Jain, Eastern Economy Edition.
4. College Physics-I. T. Bhimasankaram and G. Prasad. Himalaya Publishing House.
5. University Physics-FW Sears, MW Zemansky& HD Young,Narosa Publications, Delhi
6. Heat and Thermodynamics -N BrijLal, P Subrahmanyam, S.Chand& Co.,2012
7. Heat and Thermodynamics- MS Yadav, Anmol Publications Pvt. Ltd, 2000
8. Unified Physics Vol.2, Optics & Thermodynamics, Jai PrakashNath&Co.Ltd., Meerut

B.Sc IV Sem. – Physics

Practical Paper 4: Electricity, Magnetism and Electronics

Work load:30 hrs per semester **2 hrs/week**

1. Figure of merit of a moving coil galvanometer.
2. LCR circuit series/parallel resonance, Q factor.
3. Determination of ac-frequency –Sonometer.
4. Verification of Kirchoff's laws and Maximum Power Transfer theorem.
5. Field along the axis of a circular coil carrying current-Stewart & Gee's apparatus.
6. PN Junction Diode Characteristics
7. Zener Diode –V-I Characteristics
8. Zener Diode as a voltage regulator
9. Measurement of dielectric constant
10. Transistor CE Characteristics- Determination of hybrid parameters
11. Logic Gates- OR,AND,NOT and NAND gates. Verification of Truth Tables.
12. Verification of De Morgan's Theorems.
13. Construction of Half adder and Full adders-Verification of truth tables
14. Measurement of Hall coefficient for a semiconducting material

NOTE: *Minimum 6 Experiments need to be done and recorded from the above list*

B.Sc. 2nd year 4th Semester Physics Syllabus

PAPER-V: MODERN PHYSICS

Work load: 60 hrs per semester **4 hrs/week**

UNIT I

1. Atomic and Molecular Physics: (12 hrs)

Vector atom model and Stern-Gerlach experiment, Quantum numbers associated with it, Angular momentum of the atom, Coupling schemes(LS and JJ), Zeeman effect, Experimental arrangement to study Zeeman effect; Raman effect, Characteristics of Raman effect, Experimental arrangement to study Raman effect, Applications of Raman effect.

UNIT-II

2. Matter waves & Uncertainity Principle (12hrs)

Matter waves, de Broglie's hypothesis, Wave length of matter waves, Properties of matter

waves, Davisson and Germer's experiment, Phase and group velocities, Heisenberg's uncertainty principle for position and momentum& energy and time, Illustration of uncertainty principle using diffraction of beam of electrons (Diffraction by a single slit) and, Bohr's principle of complementarily.

UNIT-III

3. Quantum (Wave) Mechanics: (12 hrs)

Basic postulates of quantum mechanics, Schrodinger time independent and time dependent wave equations-Derivations, Physical interpretation of wave function, Eigen functions, Eigen values, Application of Schrodinger wave equation to (i) one dimensional potential box of infinite height(Infinite Potential Well)

UNIT-IV

4. Nuclear Physics: (12 hrs)

Nuclear Structure: General Properties of Nuclei, Mass defect, Binding energy; Nuclear forces: Characteristics of nuclear forces, Nuclear Models: Liquid drop model, The Shell model, Magic numbers; Nuclear Radiation detectors: G.M. Counter, Cloud chamber, Elementary Particles: Elementary Particles and their classification.

UNIT-V

5. Nano materials: (7hrs)

Nano materials – Introduction, Electron confinement, Size effect, Surface to volume ratio, Classification of nano materials– (0D, 1D, 2D), Distinct properties of nano materials (Mention-mechanical, optical, electrical, and magnetic properties); Mention of applications of nano materials: Next Generation Computer chips, sensors.

6. Superconductivity: (5 hrs)

Introduction to Superconductivity, Experimental results-critical temperature, critical magnetic

field, Meissner effect, Isotope effect, Type I and Type II superconductors, BCS theory (elementary ideas only), Applications of superconductors.

Reference Books:

1. BSc Physics, Vol.4, Telugu Akademy, Hyderabad
2. Atomic Physics by J.B. Rajam; S.Chand& Co.,
3. Modern Physics by R. Murugeshan and Kiruthiga Siva Prasath. S. Chand & Co.
4. Concepts of Modern Physics by Arthur Beiser. Tata McGraw-Hill Edition.
5. Nuclear Physics, D.C.Tayal, Himalaya Publishing House.
6. S.K. Kulkarni, Nanotechnology: Principles & Practices (Capital Publ.Co.)
7. K.K.Chattopadhyay&A.N.Banerjee, Introd.to Nanoscience and Technology(PHI LearningPriv.Limited).
8. Nano materials, A K Bandopadhyay. New Age International Pvt Ltd (2007)
9. Textbook of Nanoscience and Nanotechnology, BS Murthy, P Shankar, Baldev Raj,BB Rath and J Murday-Universities Press-IIM

B.Sc IV Sem. – Physics

Practical Paper 5: Modern Physics

Work load:30 hrs per semester **2 hrs/week**

1.e/m of an electron by Thomson method.
2. Determination of Planck's Constant (photocell).
3. Verification of inverse square law of light using photovoltaic cell.
4. Determination of the Planck's constant using LEDs of at least 4 different colours.
5. Determination of work function of material of filament of directly heated vacuum diode.
6. Synthesis of Nano Particles

7.Study of absorption of α-rays.
8. Study of absorption of β-rays.
9. Determination of Range of β-particles.
10. Determination of M & H.
11. Analysis of powder X-ray diffraction pattern to determine properties of crystals.
12. Energy gap of a semiconductor using junction diode.
13. Energy gap of a semiconductor using thermistor
14. GM counter characteristics

15. Observing Meissner effect

NOTE: *Minimum 6 Experiments need to be done and recorded from the above list*