Department of Physics, Shri Pundlik Maharaj Mahavidyalaya Nandura (Rly)

Syllabus

Class- B.Sc-III, Sem-V

Subject- Physics.

Unit I : Origin of Quantum Mechanics (12 L)

1. Historical Background: Failure of classical wave theory in explaining Black body radiation and Photoelectric Effect; Compton Effect Qualitative explanation only

2. Assumptions of Planck's Quantum Theory

3. Wave Particle Duality

4. Matter Waves: De Broglie Hypothesis, Davisson Germer experiment

5. Concept of Wave Packet, Phase velocity, group velocity and relation between them.

6. Heisenberg's uncertainty principle: Different forms of uncertainty principle; Thought experiments: single slit diffraction and Gamma ray microscope

Unit II : The Schrodinger equation and its applications (12 L)

1) Wave function and its physical significance

2) Schrodinger time dependent equation

3) Separation in time dependent and time independent parts

4) Operators in quantum Mechanics

5) Eigen functions and Eigen values

6) Particle in one dimensional and three dimensional box (Energy eigen values)

7) Qualitative analysis of potential barrier Tunneling effect)

8) Simple Harmonic Oscillator (Qualitative analysis of Zero point energy)

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Unit III : Atomic and Molecular Spectrocopy (12 L)

Vector Atom Model: Quantum Numbers, Stern Gerlach experiment; selection rules, l-s and j-j coupling, Types of spectra – Emission & absorption spectra. X-rays: Continuous X-ray spectrum, Duane and Hunt's law, characteristic X-ray spectra, Mosley's law. Raman Effect: stoke's and anti-stoke's lines, Quantum theory of Raman effect, Experimental arrangement for Raman Spectroscopy.

Unit IV : Nuclear Physics (12 L)

Detection of charged particles; G. M. counter, Binding energy and Mass defect, stability of nuclei Alpha Decay: Range of Alpha particles, Geiger - Nuttal law and Gamow's explanation of alpha decay (qualitative) Beta decay: Types and Pauli's Neutrino Hypothesis Nuclear Fission, Nuclear fusion (concepts only), Nuclear reactors.

Unit V : Hybrid parameters- low frequency equivalent of CE amplifier & its analysios., Bais stability & thermal runway (qualitative). General principles of amplifier classification, RC coupled amplifier, equivalent circuits & gain at low, medium & high frequency (qualitative), gain-frequency response. Noise & distortion in electronic circuits.

Unit VI : Feedback in amplifiers- negative feedback, advantages of negative feedback, positive feedback. Phase shift, Wein bridge, Hartley & Colpits Oscillators. Multi-vibrators – astable, monostable & bistable.

Practical : The distribution of marks for practical examination will be as follows:

Record Book 10 marks
Viva-voce 10 marks
Experiment 20 marks
Assignment 10 marks
Total 50 marks

A student will have to perform at least ten experiments per semester.

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b) The semester examination will be of Four Hour duration and student will have to perform one experiment in the semester examination.

c) In assignment, every student should be asked to submit the detailed report on one of experiments he or she has performed. The detailed report should include the theoretical background of the experiment.

1. To study RC coupled amplifier- variation of gain with load.
2. To study phase shift oscillator.
3. To study Wein bridge oscillator.
4. To study Hartlay oscillator.
5. To study Colpits oscillator.
6. To determine ‘e’ by Millikan’s oil drop experiment.
7. To determine ‘e’ by Thomsons method.
8. Determination of Rydberg’s constant.
9. To study absorption spectrum of Iodine vapors.
10. To study Raman spectrum.
11. To identify elements in optical line spectrum.
12. To determine absorption coefficient of material for gamma rays.
13. Determination of Hybrid parameters.
14. Study of monostable multivibrator.
15. Study of astable multivibrator.
16. Study of an amplifier - with & without feedback.
17. Determination of Plank's Constant by using LED.
18. To study characteristics of Zener diode.
19. Study of LED characteristics.
20. Study of characteristics of Laser.
21. Study of Emitter follower