

PH-702 Theoretical Atomic Physics

PH-702(3)- Theoretical Atomic Physics.

Course Outline:

- Quantum Mechanics and symmetry of hydrogen atom; Rotational and dynamical symmetry of the $1/r$ potential, degeneracy of hydrogen atom (S04) (6 lectures)
- Angular momentum algebra in quantum mechanics, angular momentum addition, Direct product, CGC recursion relations, irreducible tensor operators, Wigner-Eckart theorem (8 lectures)
- Relativistic quantum mechanics, Dirac equation, Relativistic hydrogen atom, Foldy-Wouthysen transformations, perturbative treatment of relativistic effects (8 lectures)
- Hartree-Fock formalism, self-consistent formalism, Koopmans' theorem (6 lectures)
- Probing the atom, atomic collision and boundary conditions, Time reversal symmetry, photoionization as half-scattering (4 lectures)
- Atomic photoionization cross section and angular distribution parameters, Cooper-Zare formula (4 lectures)
- Basic introduction to Laser cooling, BEC, atomic clock and attosecond metrology (4 lectures)