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Quantum Mechanics I

Course code: FSC410130

Credit hours: 6

Duration: 18 weeks

DESCRIPTION: Basics concepts of quantum mechanics, quantum dynamics, density matrix, angular momentum, symmetries, Hydrogen atom, approximation methods.

COURSE CONTENT:

1. Basics concepts of quantum mechanics: Dirac notation, observables, basis, measurements, uncertainty relations.
2. Quantum dynamics: Heisenberg and Schrödinger pictures, continuity equations, analytical solutions.
3. Angular momentum and addition of angular momenta.
4. Density matrix and entanglement.
5. Symmetries and conservation laws: parity and time-reversal symmetries.
6. Approximation methods: variational methods, semiclassical approximation, time-independent perturbation theory.
7. Perturbative corrections to the Hydrogen atom and Landau levels
8. Schrödinger propagator and path integrals.

BIBLIOGRAPHY:

1. J.J. Sakurai, J.J. Napolitano, *Modern Quantum Mechanics*, 2nd Ed., Addison-Wesley (2010).
2. R. Shankar, *Principles of Quantum Mechanics*, 2nd Ed., Plenum (1994).
3. L.D. Landau, E.M. Lifshitz, *Quantum Mechanics (Non-Relativistic Theory)*, 3rd Ed., Elsevier (1977).
4. L.E. Ballentine, *Quantum Mechanics: A Modern Development*, 2nd Ed., World Scientific (2014).
5. C. Cohen-Tannoudji, B. Diu, F. Lalöe, *Quantum Mechanics*, Vol. I, Wiley (1991).
6. Messiah, *Quantum Mechanics*, Wiley (1961).
7. P.A.M. Dirac, *The Principles of Quantum Mechanics*, 4th Ed., Oxford University.