PHY 611 - Quantum Mechanics

Course Code & Number	Course Name	C.H.	Lec.	Lab.	Tut.
PHY 611	Quantum Mechanics	4	4	0	0

Syllabus

Fundamental Concepts: *The Stern-Gerlach experiments, Kets, Bras and operators, Base Kets and matrix representations, Measurements, Observables and the uncertainty relations, changes of basis, Position, Momentum, Translation, Wave functions in position and momentum space.*

Quantum Dynamics: *Time–evolution and the Schrodinger equation, The Schrodinger versus the Heisenberg picture, simple harmonic oscillator, The Schrodinger wave equation, Elementary solutions to Schrodinger wave equation, Propagators and Feynmann path integrals, Potentials and gauge transformations.*

Theory of Angular Momentum: *Rotations and angular–momentum commutation relations, Spin ½, Systems and finite rotations, Euler rotations, Density operator, Spin correlation, Tensor operators.*

Symmetry in Quantum Mechanics: *Symmetries, Conservation laws and degeneracies, Discrete symmetries, Parity or spcae inversion.*

Approximation Methods: *Time independent perturbation theory: Non degenerate and degenerate, Hydrogen like atoms, Time-dependent potentials, Hamiltonian, Time-dependent perturbation theory.*

Scattering Theory: *Scattering as a time–dependent perturbation, The scattering amplitude, the Born approximation, Inelastic electron–atom scattering.*

Identical Particles: *Perturbation symmetry, Summarization postulate, Quantization of the electromagnetic field.*

Relativistic Quantum Mechanics: *Paths to relativistic quantum mechanics, The Dirac equation, Symmetries of the Dirac equation, Relativistic quantum field theory.*

References

- J. J. Sakurai, J.J. Napolitano, Modern Quantum Mechanics, 2nd Edition, Pearson, 2011.
- D. McMahon, Quantum Mechanics Demystified, 2nd Edition, McGraw-Hill, 2013.