QUANTUM MECHANICS I

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PRE-REQUISITES : Must have done the sophomore course on quantum physics and applications where Schrodinger equation, wavefunction and expectation values are taught.

INTENDED AUDIENCE : BTech Engineering Physics, B Tech Electrical Eng, MSc Physics, MSc – 5 year integrated Chemistry

COURSE OUTLINE :
This course is a first level course in the Dirac's bra(ket) notation which will set foundation to take up advanced level courses

ABOUT INSTRUCTOR :
My field of research is mathematical physics. I have been working on knot invariants from Chern-Simons theory and topological strings.

COURSE PLAN :

Week 1: Introduction to Quantum Mechanics-I, Introduction to Quantum Mechanics-II, Review of Particle in Box, Potential Well, Barrier, Harmonic Oscillator-I, Review of Particle in Box, Potential Well, Barrier, Harmonic Oscillator-II

Week 2: Bound States-I, Bound States-II, Conditions and Solutions for One Dimensional Bound States - I, Conditions and Solutions for One Dimensional Bound States - II

Week 3: Linear Vector Space (LVS) - I, Linear Vector Space (LVS) - II, Linear Vector Space (LVS) - III, Basis for Operators and States in LVS - I

Week 4: Function Spaces - I, Function Spaces - II, Postulates of Quamtum Mechanics - I ,Postulates of Quantum Mechanics – II

Week 5: Classical Vs Quantum Mechanics - I, Classical Vs Quantum Mechanics - II, Compatible Vs Incompatible Observables - I, Compatible Vs Incompatible Observables - II

Week 6: Schrodinger and Heisenberg Pictures - I, Schrodinger and Heisenberg Pictures - II, Solutions to Other Coupled Potential Energies-I, Solutions to Other Coupled Potential Energies-II

Week 7: Hydrogen Atom Wave Functions, Angular Momentum Operators, Identical Particles-I, Hydrogen Atom Wave Functions, Angular Momentum Operators, Identical Particles-II, Identical Particles,Quantum Computer-I, Identical Particles, Quantum Computer-II

Week 8: Harmonic Oscillator -I, Harmonic Oscillator -II, Ladder Operators -I, Ladder Operators -II

Week 9: Stern-Gerlach Experiment-I, Stern-Gerlach Experiment-II, Oscillator Algebra Applications-I

Week 10: Angular Momentum-1 -I,Angular Momentum-1 -II, Rotations Groups -I, Rotations Groups -II

Week 11: Addition of Angular Momentum-I, Addition of Angular Momentum-II, Clebsch-Gordan Coefficient -I, Clebsch-Gordan Coefficient -II

Week 12: Clebsch-Gordan Coefficient -III, Tensor Operators & Wigner-Eckart Theorem-I, Tensor Operators & Wigner-Eckart Theorem-II, Tensor Operators & Wigner-Eckart Theorem-III.