**PH 404: Quantum Mechanics-II (3-1-0:4)**

**Symmetries and Conservation Laws**

Noether's Theorem, symmetry operations and unitary transformations, conservation principles, space and time translations, rotation, space inversion and time reversal, symmetry and degeneracy.

**[10L+3T]**

**Approximation Methods**

Time-independent approximation methods, non-degenerate perturbation theory, degenerate case, Stark effect, Zeeman effect and other examples, Variational methods, WKB method, tunnelling,Time-dependent perturbation theory. **[12L+4T]**

**Scattering Theory**

Differential cross-section, scattering of a wave packet, integral equation for the scattering amplitude, Greens function, Born approximation, method of partial waves, low energy scattering and bound states, resonance scattering. **[9L+3T]**

**Introduction to Relativistic Quantum Mechanics**

Klein Gordon equation, Dirac equation, negative energy solutions, antiparticles, Dirac hole theory.

 **[5L+2T]**

**Textbooks and References**

1. W. Greiner and B. Miller, “Quantum Mechanics: Symmetries”, 2nd edition, Springer, 1994.
2. M. Beck, “Quantum Mechanics: Theory and Experiment”, 1st edition, Oxford University Press, USA, 2012.
3. R*.* Shankar, “Principles of Quantum Mechanics”, 2nd Edition, Plenum Press, New York, 2010.
4. J. J. Sakurai, “Modern Quantum Mechanics”, 2nd edition, Addison Wesley, 2013.
5. W. Greiner, “Relativistic Quantum Mechanics: Wave Equations”, 3rd edition, Springer, 2000.