

2005-2006

SYLLABUS

SSPS-310

III SEMESTER

SSPS-314

P301: Advanced Quantum Mechanics

1. Linear Vector Spaces in Quantum Mechanics:

Vectors and operators, change of basis, Dirac's bra and ket notations. Eigen value problem for operators. The continuous spectrum. Application to wave mechanics in one dimension.

(Merzbacher Sec. 14.1, 14.2, 14.3, 14.4, 14.5, 14.6, 14.7)

2. Quantum Dynamics :

The equation of motion, Quantization postulates, canonical quantization, Constants of motion and invariance properties. Heisenberg picture. Harmonic Oscillator.

(Merzbacher . Sec. 15.1, 15.2, 15.3, 15.4, 15.6, 15.7)

3. Development of time-dependent perturbation theory.: The golden rule for constant transition rates. (Merzbacher, Chapter. 18 relevant parts)

4. Addition of two angular momenta. Tensor operators.

Wigner-Eckart theorem. Matrix elements of vector operators. Parity and time reversal symmetries.

(Merzbacher . Section. 16.6, 16.8, 16.10, 16.11)

5. Scattering:

Concept of differential cross-section. Scattering of a wave packet. Born approximation. Partial waves and phase shift analysis.

(Merzbacher. Section. 11.1, 11.2, 11.4, 11.5)

6. Relativistic Quantum Mechanics

Klein - Gordon equation, Dirac equation for a free particle, Equation of continuity, Spin of a Dirac particle, Solutions of free particle Dirac equation, Negative energy states and hole theory

Textbooks:

1. "Quantum Mechanics " by E. Merzbacher (John Wiley & Sons, Inc., New York)
2. " Quantum Mechanics" by R.D. Ratna Raju

Reference Books:

1. " Quantum Mechanics" by Thankappan
2. "Quantum Mechanics" by Biswas

* PLEASE SET TWO DIFFERENT QUESTION PAPER

* KINDLY ALIEN TO THE SYLLABUS STRICTLY.

~~KINDLY AVOID THE REPEATED QUESTIONS FROM THE MODEL QUESTION PAPER.~~