Physics 4851/6850 Quantum Mechanics - Winter 2016

Instructor
Dr. Stephanie Curnoe
Office: Room C3003, Phone 864-8888

Schedule
Tuesdays and Thursdays, 10:30 -11:45
Room C3067

Recommended Textbook
Quantum Mechanics, vols. 1 & 2 by C. Cohen-Tannoudji, B. Diu and F. Laloë

Other Recommended References
Quantum Mechanics by A. Messiah
Quantum Theory of Many Particle Systems by Fetter and Walecka

Evaluation Scheme
Assignments (4-5) 25%
Mid-term examination 25% (Thursday February 18, 2016)
Final examination 50%
Supplemental examination will not be available.

Prerequisites
The expected background for this course is PHYS 4850, which includes the following topics:

- 1D potential problems (finite and infinite square wells, delta-function potential; transmission and reflection coefficients, phase shifts; plane waves and Fourier transforms)
- Measurements, probabilities & averages
- Bra-ket notation and matrix representations of operators, bras and kets
- Harmonic oscillator (raising and lowering operators, number operator)
- Angular momentum (orbital angular momentum and spherical harmonics; spin; addition of angular momentum and Clebsch-Gordan coefficients; rotations)
• Time-independent perturbation theory.

Students unfamiliar with the background material will be expected to cover it by studying the recommended textbooks. There will be lectures on background topics only if there is a need for it among the entire class.

Outline

1. Tensor product of state spaces and entanglement
2. Operators: unitary operators, parity operator, density operator, evolution operator
3. Schrödinger, Heisenberg and interaction pictures of QM
4. Gauge invariance
5. Rotations, translations, inversion, time translation, time reversal
6. Time dependent perturbation theory
7. Identical particles
8. Second quantisation
9. Propagators
10. Path integrals