PHY 7400 – Quantum Mechanics I – Syllabus

Semester: Fall 2005

Lecturer:

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Lecture Time/Room:

Lecture **Monday, Wednesday, Friday 12.50-1.45 pm**, 185 Physics Building

Suggested Texts:

E. Merzbacher, **Quantum Mechanics**, (3rd edition, John Wiley & Sons, Inc.);
J. J. Sakurai, **Modern Quantum Mechanics**, (Addison-Wesley Publ. Company);
L. Landau and E. Lifshits, **Quantum Mechanics**, (Butterworth-Heinemann Ltd).

E. Merzbacher's text will be the main textbook for this course.

Office Hours: by appointment.

Grading:

Your course grade will be determined by your performance in homework assignments, two midterm exams and a Final Exam on the basis of the following distribution.

Homework Projects (typically every week)	20%
First Hourly Exam	20%
Second Hourly Exam	20%
Final Exam	40%

The completed homework assignments are due at 5 pm on the date specified; typically one week after the assignment is given. Late submissions will not be accepted.

Course description and objectives:

This course provides an introduction to methods of quantum mechanics, including Schrödinger equation and its solutions as applied to simple physical problems, elementary approximate methods, and scattering theory.

Topics to be covered (approximate):

1. **Physical principles of quantum mechanics.** Wave nature of matter. Davisson-Germer experiment. The wave function. Superposition principle.
2. **Mathematics of quantum mechanics.** Operators and expectation values. Commutators and operator algebra.
3. **The principles of wave mechanics. General properties of the motion of quantum objects.** Schrödinger's equation.
4. **Examples of one-dimensional motion.** The linear harmonic oscillator. Sectionally-constant potentials in one dimension.
5. **The WKB approximation.** WKB method. Bohr-Sommerfeld quantization conditions.
6. **Variational method and perturbation theory.**
7. **Matrix formulation of quantum mechanics.** Vector spaces. Bra-Ket notations. Representation theory. The Heisenberg uncertainty relations.
8. **Angular momentum in quantum mechanics.** Spherical harmonics. Spherically-symmetric potentials.
9. **Scattering.** The cross-section. The Green's functions. Partial waves and phase shifts.
10. **Quantum dynamics.**

The material discussed in class will approximately correspond to the first fourteen chapters of E. Merzbacher's book (**Quantum Mechanics)**.

Website: http://www.physics.wayne.edu/~apetrov/PHY7400/