

# Physics 430 (Quantum Mechanics I)

## Course Information, Fall 2017

**Instructor:** Jeff Greensite

**Contact Info:** Thornton 304, 338-1600, greensit (at) sfsu.edu

**Office Hours:** TBA

### Content

This is the first semester of a two-semester course on quantum mechanics. It will cover:

1. A review (or, for some, an introduction) to Lagrangian and Hamiltonian dynamics.
2. The historical background: Black-body radiation, the photoelectric effect, the Compton effect, electron diffraction.
3. The Bohr atom, the De Broglie relations, development of the Schrodinger equation. Ehrenfest's Principle.
4. Hilbert space, bra-ket notation, the Dirac delta function. Hermitian operators and observables. The Heisenberg Uncertainty Principle.
5. Rectangular Potentials. Bound States, Tunneling, and Scattering.
6. The Harmonic Oscillator.
7. Symmetry and Degeneracy.
8. The quantization of angular momentum.
9. The Hydrogen Atom

Three lectures, on average, will be devoted to each of the topics listed. As in any physics course, you will be asked to demonstrate your mastery of these topics by solving quantitative problems in each area from first principles, both on homework sets and on the exams.

Course objectives: By the end of the course, you should be familiar with the basic principles of quantum theory, and be able to solve the Schrodinger equation (as well as computing observables of interest) in elementary one, two, and three-dimensional potentials.

**Prerequisites:**

1. PHYS 320 (Modern Physics),
2. PHYS 360 (Electromagnetism), which may be taken concurrently,
3. PHYS 385 (Intro to Theor. Phys)
4. Math 245 OR Math 376 (Diff. Equations).

These prerequisites will be checked and enforced. If you wish to request an exception, you must come and talk to me about it.

**Text:**

The textbook is an e-book, *An Introduction to Quantum Theory*, written by me, and published by IoP Publishing. It will hopefully be available online (for free) early in the semester. If you wish you may buy a hardcopy from Amazon, but be warned that this will set you back \$154, and it should not be necessary.

**Course Organization**

**Lectures:** Tu and Th 3:35-4:50 in TH 425.

**Homework:** There will be eight homework assignments to be handed in during the semester. Homework is expected to be handed in on time. Although these assignments don't count heavily in the grading, it is *essential* that you do them. Experience shows that students who ignore the homework do very poorly on the exams. Solutions will be made available, periodically, online.

You are welcome to collaborate with other students on homework problems. However, this should be in the form of working out the general approach; you should not simply copy someone else's work.

**Exams:** There will be two exams: a midterm and a take-home final.

**Grades:**

1. Final - 50%
2. Midterm - 40%
3. Homework - 10%

## **Disability Statement**

Students with disabilities who need reasonable accommodations are encouraged to contact the instructor. The Disability Programs and Resource Center (DPRC) is available to facilitate the reasonable accommodations process. The DPRC is located in the Student Service Building and can be reached by telephone (voice/TTY 415-338-2472) or by email (dprc@sfsu.edu).

## **Withdrawal Policy**

Please consult <http://www.physics.sfsu.edu/policy/withdrawal.pdf>