PHYS 485/685 **QUANTUM MECHANICS I** **Fall 2009**
(3 credits)

Instructor: Dr. Alan R. Denton, South Engineering 214B
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Meetings: TTh 9:30-10:45 a.m.
South Engineering 221

Office Hours: TTh 10:45 a.m.-12:00 p.m.
(or by arrangement)

Goal: Master the foundations of quantum mechanics, including fundamental concepts, key experiments, theoretical methods, and practical applications to a variety of systems.

Preparation: Basic knowledge of classical mechanics, modern physics, linear algebra, differential equations, and transform methods. Prereq: PHYS 350, MATH 266.

Student Responsibilities: Read assigned material in advance. Come prepared for discussion. Ask questions and give me feedback. Complete assignments on time.

Muddiest Point: Before Tuesday 9:00 a.m., send me an e-mail to let me know the one concept that you *least* understand. I will address questions (anonymously) in class.

Text: D. J. Griffiths, Introduction to Quantum Mechanics, 2nd edition (Pearson, 2005). See also notes and resources on LON-CAPA homepage and books on reference list.

Evaluation: quizzes and participation (5%); homework assignments (25%); 3 exams (20%, 20%, 30%); assignments for 685 students will include an additional project.

Homework and Lateness: Group discussion of homework is strongly encouraged, but written solutions must be your own. Late work will be accepted with a 20% penalty/day until next class. (Sorry, but we must keep on track.)

Grading: A: 90-100%, B: 75-89.9%, C: 60-74.9%, D: 50-59.9%, F: $< 50\%$

Bulletin Description: Operators, one-dimensional wells and barriers, Schrödinger equation, uncertainty, duality, Born interpretation, unstable states, bosons and fermions, central force problems, angular momentum, spin.

Major Topics

- **Wave Mechanics:** Wave-Particle Duality, Probability, Uncertainty Principle
- **Time-Independent Schrödinger Equation:**
  Stationary States, Free Particles, Simple Potentials (Square-Well, Harmonic Oscillator)
- **Formalism:** Hilbert Space, Observables, Eigenvalues and Eigenfunctions
- **QM in 3D:** Spherical Coordinates, Hydrogen Atom, Angular Momentum, Spin
- **Identical Particles:** Fermions, Bosons, Two-Particle Systems, Atoms, Solids

All work in this course must be completed in a manner consistent with NDSU University Senate Policy, section 335: Code of Academic Responsibility and Conduct:
`http://www.ndsu.nodak.edu/policy/335.htm`

Any students with disabilities who need accomodation in this course are encouraged to speak with the instructor as soon as possible to make appropriate arrangements.