

QUANTUM MECHANICS I

3 credits

Instructor: Andrei Kryjevski, South Engineering 318D
andrei.kryjevski@ndsu.edu Tel: 701-231-7046

Meetings: Tu Th 9:30-10:45 **Office Hours:** W 14:00-16:00
South Engineering 221 (or by arrangement)

Goal: To 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, optics, modern physics, linear algebra, differential equations. 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.

Text: D. J. Griffiths, D. F. Schroeter **Introduction to Quantum Mechanics**, 3rd edition (Cambridge University Press, 2018).

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

Major Topics:

- **The Wave Function:** The Schrödinger Equation, Statistical Interpretation, Momentum, The Uncertainty Principle, Hilbert Space, Operators and Observables, Dirac Notation
- **Time-Independent Schrödinger Equation:** Stationary States, Simple Exactly Solvable Quantum Mechanical Systems
- **Quantum Mechanics in Three Dimensions:** Spherical Coordinates, The Hydrogen Atom, Angular Momentum, Spin
- **Identical Particles:** Two-Particle Systems, Fermions, Bosons, Atoms, Solids, Quantum Statistical Mechanics

Evaluation: homework assignments (40%); 3 exams (15%, 15%, 30%); assignments for graduate 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.

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

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.