Instructor: Eric Foard, SO ENG 318 E, eric.foard@ndsu.edu, 701-231-7045

Office Hours: TuTh 10:45-12:00 AM, open door, and by appointment.

Description: “Quantum Mechanics I” is a practical, hands-on, course in doing quantum mechanics. Concentration on techniques and approaches trumps conceptual understanding. Assessment is based on homework solutions and exams, and a semester project for 685 students.

Objectives and Philosophy: Before one can understand what quantum mechanics is, one must become familiar with what quantum mechanics does. This course will familiarize the student with the later, in order to facilitate the former. By the end of the semester, students will have learned and practiced the tools needed to begin solving those problems in quantum mechanics which are more than simply “instructive” contrivances, and in the process will gain an understanding of the fundamental concepts.

Necessary Skills: Basic understanding of classical mechanics and electrodynamics. Familiarity with linear algebra, complex analysis, and differential calculus. Experience with Fourier analysis and using Dirac delta functions is also useful.

Textbook: Introduction to Quantum Mechanics, 2nd edition, D. J. Griffiths, Pearson, and additional resources as they are introduced.

Course Outline: PART I THEORY
The Wave Function: Schrödinger Eq., Wave-Partical Duality, Probability, Uncertainty Principle
Time-independent Schrödinger Equation: Stationary States, Simple Potentials, Free Particle
Formalism: Hilbert Space, Observables, Eigenfunctions, Uncertainty Principle, Dirac Notation
Quantum Mechanics in Three Dimensions: Spherical Coord., \( ^1 \text{H} \), Angular Momentum, Spin
Identical Particles: Fermions, Bosons, Two-Particle Systems, Atoms, Solids

Homework: Group discussion of homework assignments is strongly encouraged, and recommended as a good way to learn how different approaches with varying difficulty can often lead to the same solution. However, each student must provide their own solution, and be prepared to explain their steps if called upon to do so. Late homework will be accessed a 20% penalty per day. Homework problems should be printed or written in ink on one side of 8\(\frac{1}{2}'' \times 11''\) pages which are stapled together. Show all steps, give all equations before substituting numerical values, always include appropriate units, and box/circle/underline final answers. 685 students will recieve additional homework problems.

Exams: Two mid-term exams will be given in class at dates to be determined. The final exam will
be given at Tuesday, Dec. 15 10:30am. In the case of an unavoidable absence, a student may be
allowed to take an alternate exam, pending instructor approval. No arrangements for a makeup
exam will be approved after the scheduled exam has started. In addition to written exams, 685
students will complete an oral component of each exam. All exams are cumulative.

Project: Students taking 685 will complete a project and will give an oral presentation of their
work to the class during Dead-Week.

Grading: Letter grades are based on the “10-point scale”.

A: 90–100%, B: 80–89.5%, C: 70–79.5%, D: 60–69.5%, F: 0–59.5%
Homework and Quizzes .................................................30%
Midterm Exams (2) .........................................................40% (20 % ea)
Final Exam .................................................................30% (20 % for 685)
Final Project (685 only) ......................................................10%

American with Disabilities Act: Any students with disabilities or other special needs, who
need special accommodations in this course are invited to share these concerns or requests with the
instructor and contact the Disability Services Office as soon as possible.

Academic Honesty: The academic community is operated on the basis of honesty, integrity,
and fair play. NDSU Policy 335: Code of Academic Responsibility and Conduct applies to cases in
which cheating, plagiarism, or other academic misconduct have occurred in an instructional context.
Students found guilty of academic misconduct are subject to penalties, up to and possibly including
suspension and/or expulsion. Student academic misconduct records are maintained by the Office
of Registration and Records. Informational resources about academic honesty for students and
instructional staff members can be found at www.ndsu.edu/academic honesty