

Quantum Physics I

Bulletin Description: Dirac formalism, quantum nature of measurements, wave/matrix mechanics, Feynman path integrals, dynamics, symmetry and angular momentum, perturbation theory, scattering.

Instructor: Erik K. Hobbie, Batcheller Technology Center, Rm. 251
erik.hobbie@ndsu.edu
701-231-6103

Lectures: T/Th 12:30-1:45 PM
South Engineering, Rm. 221

Office Hours: T/Th 2:30-3:30 PM

Text: Textbook – Sakurai/Napolitano, *Modern Quantum Mechanics*, 2nd edition

Goals: The course uses the Dirac formalism to develop a quantum description of measurements and wave/matrix mechanics, with an emphasis on dynamics and symmetry. Feynman path integrals are also introduced, and the conventional static/dynamic approximation schemes are derived and applied to practical problems such as the scattering, absorption and emission of light by particles.

Grading: Grading will be based on a combination of homework (40 %, details TBD), two midterm exams (20 % each for a total of 40 %), and a final exam (20 %). The grading scale will be > 80 % (A), 70 - 80 % (B), 60 - 70 % (C), 50 - 60 % (D), < 50 % (F).

Topics: Week 1 (Aug. 22, 24); Dirac notation, matrices, measurement (1.1-1.4)
Week 2. (Aug. 29, Aug. 31); Basis sets, position/momentum space (1.4-1.7)
Week 3. (Sept. 5, 7); Elementary solutions, dynamics (2.1-2.3)
Week 4 (Sept. 12, 14); Dynamics (2.3-2.5)
Week 5 (Sept. 19, 21); Path integrals, gauge transformations (2.6-2.7)
Week 6. (Sept. 26, Sept. 28); Angular momentum (3.1-3.3)
Week 7 (Oct. 3, 5); Angular momentum, MT1 (3.4-3.7)
Week 8 (Oct. 10, 12); Angular momentum (3.8-3.11)
Week 9 (Oct. 17, 19); Symmetry (4.1-4.2)
Week 10 (Oct. 24, 26); Symmetry (4.3-4.4)
Week 11 (Oct. 31, Nov. 2); Static perturbation theory, MT2 (5.1-5.2)
Week 12 (Nov. 7, 9); Variational methods, dynamic perturbation theory (5.3-5.5)
Week 13 (Nov. 14, 16); Dynamic perturbation theory (5.6-5.9)
Week 14 (Nov. 21, TGB); Scattering (6.1-6.4)
Week 15 (Nov. 28, 30); Scattering (6.5-6.9)
Week 16 (Dec. 5, 7); Modern topics (entanglement and computing)
Week 17 (Final)

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](#).

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/academichonesty.

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 as soon as possible.