

PHYS3701 Introduction to Quantum Mechanics (Spring 2019)

Class Schedule as of April 16, 2019

Homework assignments from

Quantum Mechanics, 6e (Taylor & Francis 2016) Second Printing, by Alastair I. M. Rae and Jim Napolitano

| Day | Date | Topics | HW Due |
|-------------------------------|--------|---|-------------|
| Tue | 15 Jan | Review: Waves, Electromagnetism, Continuity Equation, Relativity, and Matter Waves | — |
| Thu | 17 Jan | Schrödinger's wave equation; Interpreting the wave function; Energy eigenvalues | 1.8, 4.10 |
| Tue | 22 Jan | Quiz #1 ; Bound states in one dimension; Infinite and finite square wells | — |
| Thu | 24 Jan | The quantum mechanical harmonic oscillator in one dimension | 5.4, 5.5 |
| Tue | 29 Jan | Quiz #2 ; Separation of variables in three dimensions using Cartesian coordinates | — |
| Thu | 31 Jan | Stationary states in problems with spherical symmetry; Spherical harmonics | 5.14, 6.4 |
| Tue | 5 Feb | Quiz #3 ; Energies and wave functions of one-electron atoms | — |
| Thu | 7 Feb | More examples: Isotropic harmonic oscillator, cylindrical box, periodic potentials | 6.13, 6.14 |
| Tue | 12 Feb | Quiz #4 ; Formal quantum mechanics: Position, momentum, and Hamiltonian operators | — |
| Thu | 14 Feb | Observables, expectation values, and compatibility | 6.5, 6.8 |
| Tue | 19 Feb | Quiz #5 ; Dirac notation and the fundamental postulates of quantum mechanics | — |
| Thu | 21 Feb | Solving the simple harmonic oscillator with operator algebra | 7.1, 7.11 |
| Tue | 26 Feb | Quiz #6 ; The angular momentum operators \mathbf{L} and \mathbf{L}^2 , and spherical harmonics | — |
| Thu | 28 Feb | Angular momentum eigenvalues from operator algebra; Hints of half-integer "spin" | 7.12, 8.4 |
| March 5-8 Spring Break | | | |
| Tue | 12 Mar | Quiz #7 ; The Stern-Gerlach experiment and spin-1/2 | — |
| Thu | 14 Mar | Spin precession; Orbital, spin, and total angular momentum | 8.14, 9.4 |
| Tue | 19 Mar | Quiz #8 ; The variational principle as an approximation scheme for energy eigenstates | — |
| Thu | 21 Mar | The time-independent perturbation expansion for non-degenerate energy eigenstates | 9.12, 9.14 |
| Tue | 26 Mar | Quiz #9 ; Degenerate perturbation theory; The linear Stark effect | — |
| Thu | 28 Mar | Application to atoms: The spin-orbit interaction and the Zeeman effect | 10.4, 10.16 |
| Tue | 2 Apr | Quiz #10 ; Time dependent Hamiltonians; The sudden approximation | — |
| Thu | 4 Apr | Time dependent perturbation theory perturbation theory; Spin resonance phenomena | 10.5, 10.14 |
| Tue | 9 Apr | Quiz #11 ; Fermi's Golden Rule | — |
| Thu | 11 Apr | Electromagnetic transitions and selection rules | 11.8, 11.12 |
| Tue | 16 Apr | Quiz #12 ; Scattering in one dimension; Quantum mechanical tunneling | — |
| Thu | 18 Apr | Scattering in three dimensions, cross section, and the Born approximation | 11.13, 12.1 |
| Tue | 23 Apr | Quiz #13 ; Examples: The square well and Yukawa/Coulomb potentials | — |
| Thu | 25 Apr | Course Review : Brief summary then student questions | 12.6, 12.7 |