

PART I: FUNDAMENTALS

1 The basic formulation. (Zettili Ch.2, §3.1-3.5)

- (a) Linear algebra and the postulates of quantum mechanics.
- (b) Matrix representations and incompatible observables.
- (c) The Schrödinger equation in its simplest form.
 - *Problem set #1: Due Friday 10 September*

2 Hilbert space. (Zettili §2.6-2.10, §3.6-3.10, §4.1-4.3)

- (a) Generalization to infinite dimensions and continuous bases.
- (b) Fourier transforms and Dirac delta functions.
- (c) The Schrödinger wave equation
- (d) The position-momentum uncertainty relation
- (e) Plane waves and trapped particles, bound and continuum states
 - *Problem set #2: Due Wednesday 22 September*

3 One-Dimensional Problems. (Zettili Ch.4)

- (a) Wave packets and group velocity
- (b) Square wells and barrier penetration
- (c) The simple harmonic oscillator
- (d) Harmonic oscillator wavefunctions
 - *Problem set #3: Due Friday 15 October*

MIDTERM EXAM WEDNESDAY 20 OCTOBER

PART II: THREE DIMENSIONS

4 Angular momentum. (Zettili Ch.5)

- (a) States and operators in three dimensions.
- (b) Angular momentum algebra.
- (c) Precession of an angular momentum in a magnetic field.
 - *Problem set #4: Due Wednesday 3 November*

5 The two-body problem in quantum mechanics. (Zettili Ch. 6)

- (a) Motion of a particle in a central potential.
- (b) The isotropic oscillator.
- (c) The nonrelativistic hydrogen atom.
- (d) Hydrogen spin and parity.
 - *Problem set #5: Due Wednesday 17 November*

6 Perturbation theory. (Zettili §9.2)