Physics 137A, Spring 2003
Course Outline
Instructor: Martin White, 561-C Campbell
GSI: Peter Shepard (pgs@socrates)
Lectures: Tu/Th 9:30-11:00am, 343 LeConte
Office Hours-MW: Th 11-12 (561 Campbell)
Office Hours-PS: M 1pm & Tu 11am (281 LeConte),
Th 11-12 (Milano)
Exams: problem sets (30%), midterm (30%), fi-
nal (40%)
Texts: Griffiths (Merzbacher, Sakurai, Baym)

1. Fundamentals of Quantum Mechanics
   (a) Interference and uncertainty
   (b) Linear algebra, Hilbert spaces and bra-
et notation, connection with wave me-
chanics
   (c) Postulates of QM, precise statement
       of Uncertainty Principle
   (d) Time evolution and the Schrödinger
       equation.
   (e) Schrödinger and Heisenberg pictures,
       spin precession and the non-classicality
       of the spin-vector
   (f) Connection with classical mechanics,
       Ehrenfest and virial theorems.
   (g) Path integral formulation.
2. One-dimensional problems in Wave Mechan-
ics
   (a) Connection of bra-ket notation with
       Wave Mechanics, stationary states
   (b) Conservation of probability current and
       spreading of the wavepacket
   (c) Escape proof box, bound states, sym-
       metry of states, double well
   (d) Scattering theory in 1D, phase shift,
       resonances and bound states, evolu-
       tion of a wave packet
   (e) Nanocircuits and the Quantum Point
       Contact, Landauer conductance
   (f) Harmonic oscillator, raising and low-
       ering operators, coherent states
   (g) Example of decoherence, Schrödinger’s
       cat
3. Interlude
   (a) Quantum computers
   (b) Quantum cryptography
4. WKB Methods
   (a) The classical limit and semi-classical
       methods
   (b) Matching conditions and integral quanti-
       zation condition
   (c) Quantum bouncing ball and evanes-
       cent waves
   (d) Barrier penetration
   (e) WKB and the virial theorem
5. Many particles and many dimensions
   (a) Many particle systems
   (b) Systems of more than 1D
6. Hydrogen atom
   (a) Central potentials
   (b) Separation of variables
   (c) Energy eigenvalues/eigenfunctions