

## 6.728 APPLIED QUANTUM MECHANICS

### Final Exam Topics

1. Fundamentals of Quantum Mechanics:  
S-Equation, eigen functions and values, expectation values, Ehrenfest's Theorem, probability density and flux.
2. 1D solutions:  
Particle in a box, Free particle, Tunneling, Potential Barriers  
SHO: solutions, energy, creation and annihilation operators,
3. Approximation schemes  
WKB, Variational, Finite Basis State Expansions
4. LC Circuit as SHO,  $v$  and  $i$   
E&M field as a collection of SHO's.
5. Two level system
  1. Time evolution with static coupling (See Quiz 2)
  2. Time evolution with sinusoidal drive
6. 2D and 3D problems
7. Coupled systems: Product state basis
8. Density of States
9. Application of Fermi's Golden Rule
10. Statistical Mechanics
  - (a) Finding the average number of particles and energy in a level; chemical potential
  - (b) Fermions and Bosons
  - (c) Simple models of Semiconductors and Metals
11. Hydrogen Atom and Central Potentials (See solutions from the last problem set.)

**The final exam for 6.728 will be Monday, December 18 from 9:00AM - 12:00NOON .**