

Phys 402: Applications of Quantum Mechanics

Lecturer: Fei Zhou

Time: Tu, Th 930-1100AM

Location: Hebb 12

Pre-reading materials and learning goals

Textbook: David Griffiths, *Introduction to Quantum Mechanics* (Pearson Prentice Hall, 2nd edition)

- 1) Week 1: Chapter 6, section 6.1, 6.2.
Learning goal: Understand non-degenerate perturbation theories; first and second order perturbations.
- 2) Week 2: Chapter 6. Section 6.2, 6.3.
Learning goal: Degenerate perturbation theory; application to hydrogen atoms.
- 3) Week 3: in-class problem for Lecture 2-3; Chapter 6, section 6.2, 6.3.
Learning goal: Second order perturbations; two-level system physics; spin-orbit coupling.
If you want to review the stuff on harmonic oscillators and hydrogen atoms, See section 2.3 and section 4.5 in Part I.
- 4) Week 4: review the spin algebra in section 4.4 and prepare for the discussions on spin-orbit coupling.
- 5) Week 5: Section 4.3 Angular momentum. The Ladder of angular momentum Fig.4.8. And Section 6.3, 6.4.

Understand how states with different angular momentum are organized and the origin of spin-orbit coupling.
- 6) Week 9: Chapter 7 section 7.1 and 7.2. The variational method.
- 7) Week 10: WKB method and semi-classical approximation.
- 8) Weeks of March 11-22: Chapter 9, section 9.1. Basic concepts of time dependent perturbations.
- 9) The last week of the term: Chapter 9, section 9.2. Also review section 9.1, sinusoidal perturbations. Understand the difference between absorption and coherent Rabi oscillations in Chapter 9.1.

