

Physics 125c
Course Notes

Notes about course:

- There is no official text for this course. Instead, I will hand out various course notes on the topics we will cover. However, you may wish to refer to any of a large number of available books on quantum mechanics.
- Grade will be entirely on homework, that is, there will be homework sets as usual instead of a modterm or final.
- Homework will be handed out Wednesday, due the following Wednesday.
- Collaboration policy: OK to work together in small groups, and to help with each other's understanding. Best to first give problems a good try by yourself. Don't just copy someone else's work – whatever you turn in should be what you think you understand.
- There is a web page for this course, which should be referred to for the most up-to-date information. The URL:
<http://www.hep.caltech.edu/~fcp/ph125/>
- TAs:
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 - Joan Erwin, rjerwin@caltech.edu;
 - Donal O'Connell, donal@caltech.edu.
- I have solutions to some of the problems on my web site. Do not look at these until after you have turned in the problem set!

We will continue more-or-less along the plan that Professor Weinstein laid out for the course. Here is a brief outline of the topics I plan to cover:

1. Approximate methods (continued)
 - (a) Variational method
 - (b) WKB approximation

- (c) method of stationary phase
- (d) Time-dependent perturbation theory, including Fermi's golden rule, Born approximation

2. Scattering

- (a) S matrix
- (b) Cross sections
- (c) Partial wave expansion
- (d) Optical theorem
- (e) Resonances
- (f) Phase shifts

3. Identical particles

4. Electromagnetic interactions

- (a) Absorption of light
- (b) Quantization of the electromagnetic field
- (c) Vacuum fluctuations
- (d) Einstein A and B coefficients

5. Density matrix formalism

- (a) Statistical ensembles
- (b) Entropy, von Neumann mixing theorem