

# PHYS-3301 Quantum Mechanics I December Exam Study Guide

## Schedule & Policies

- Review Sessions: Monday 5 December 9:30-10:30AM and 1:30-2:30PM, room 2L15  
These will be like office hours, so bring your questions!
- **EXAM:** Friday 9 December 1:30PM, room 3M64 (same as lectures)
  - **The exam will start promptly and end in 2 hours at 3:30PM!**
  - No electronic equipment will be allowed.
  - The test is closed-book (no notes, text, etc, allowed).
  - Be prepared to present identification.

## Study Hints

General help:

- The last topic covered will be the Doppler effect, from lectures on 25 Nov 2011.
- You should study the homework assignments and solutions. The exam problems will not be exactly the same as the homework (they will mostly be shorter), but there will be similarities.

Here are basic ideas of the course as seen by the instructor. The most important ideas are underlined (of course, the other ideas may appear on the exam):

- *Galilean Relativity:* relativity principle (and idea of symmetries in general), transformation of physical quantities between frames, covariance of physical law
- *Einsteinian Relativity:* relativity principle
- *Lorentz Transformations:* the actual Lorentz transformations, the invariant interval, how to sketch a spacetime diagram
- *Velocities:* coordinate velocity vs 4-velocity, coordinate velocity Lorentz transformation
- *4-Vectors:* definition, upper and lower indices (& their Lorentz transformations), Einstein summation convention, the metric and relativistic scalar product, covariant equations  
*Comment:* You will need to recognize 4-vector indices if you see them on the exam.
- *4-Momentum:* definition, conservation, mass, relation of energy and momentum, massless particles, relation to velocity, natural units
- *Collisions, Decays:* 4-momentum conservation to determine results of scattering and decay processes *Comment:* This material is considered the main goal of the course.
- *Doppler Effect:* derivation by invariants, use of Doppler effect formula

The exam cover sheet will include a list of helpful equations and formulae. The exam itself will be a mix of short-answer questions and longer problems involving more calculations.