

Univ. of Winnipeg Dept. of Physics  
Fall/Winter 2011-12

## PHYS-3301 Quantum Mechanics I

Lecture Times: MWF 9:30-10:20AM

Room: 3M64

Instructor: Fall– Dr. Andrew Frey; Winter – Dr. Melanie Martin

E-mail: a.frey, m.martin@uwinnipeg.ca

Office: AF – 3L17; MM – 3L21

Office Phone: AF – 786-9215; MM – 786-9442

WWW: Fall – [http://ion.uwinnipeg.ca/~afrey/qm1\\_11-12/](http://ion.uwinnipeg.ca/~afrey/qm1_11-12/)

Winter – none

Office Hours: AF – T 9:30-10:30AM Fall term only

MM – MW 11AM-12PM Winter term

or by appointment

### Course Description

This course provides an introduction to 20th century physics, specifically special relativity and quantum mechanics.

### Textbooks

There are two required texts, but others may be helpful.

- **Required:** *Introduction to the Relativity Principle* by Barton
- **Required:** *Quantum Mechanics* by Scherrer
- **Supplementary:** Notes by Hogg at <http://cosmo.nyu.edu/hogg/sr/>

In addition, some extra reading (from other texts, journal articles, etc) may be assigned.

### Topics

We will discuss

- Special Relativity
  - Symmetries & Galilean Relativity
  - Einsteinian Relativity Principle
  - Lorentz Transformations & Invariants
  - 4-Vectors & The Metric
  - Relativistic Momentum & Energy
  - Particle Collisions
  - Doppler Effect
- Quantum Mechanics
  - Historical Beginnings of QM
  - Linear Algebra
  - Schrödinger Equation
  - One-Dimensional Quantum Mechanics
  - Three-Dimensional Quantum Mechanics
    - \* Angular Momentum
    - \* Hydrogen Atom

Not all topics above will be covered equally. Also, some topics may be skipped, added, or substituted due to time constraints.

### Assignment Policies

**Homework:** In the **fall term**, assignments will be posted on the course web page (see above) in PDF format approximately once per week, and you will be notified in class. They will **NOT** be handed out in class, so

you must notify the instructor if you cannot access the assignments! The assignment will then be due in class one week later (the due date will be listed on the web page). Homework solutions will be posted on the course web page as soon as possible after the homework is due. **You will receive an updated course outline in January explaining Winter term assignment distribution and deadline requirements.** Collaboration on the problems is allowed, but each student must write up the solutions independently. Late assignments will **not** be accepted without prior permission from the instructor.

**Exams:** No electronic equipment is allowed during either in-class tests or the final exam, except at the discretion of the instructor. Students should be prepared to present identification at tests and exams.

**Organization:** Your homework and exam solutions should be written (or typed) neatly with steps explained *as if you were writing a research paper*. Not all algebra need be shown if the steps are explained in words; however, showing your work may improve your credit if you make a mistake. Homework that is not neatly organized and written will not be graded and will be given **zero credit** (one warning will be allowed). In addition, multiple pages must be stapled together.

**Regrading:** If you feel that there is a mistake in grading, please discuss with the instructor. Please also see the section on appeals.

## Evaluation

**Grades:** Grades will consist of the following components:

- Homework Assignments: 25%
- December Exam: 25%
- February In-Class Test: 15%
- Final Exam: 35%

**Exam & Other Important Dates:** Dates to note include

- Extra Day of Monday Class Schedule: Nov 30, 2011
- Extra Day of Friday Class Schedule: Dec 1, 2011
- December Exam: Dec 9, 2011 (subject to university scheduling)
- Voluntary Withdrawal Date: Jan 19, 2012
- February In-Class Test: Feb 15, 2012
- Reading Week: Feb 20-25, 2012
- Final Exam: April 11, 2012 (subject to university scheduling)

Exam times to be announced.

## Miscellaneous

**Appeals and Misconduct:** See Section VII of the **Course Calendar** regarding Academic Regulations and Policies including appeals and academic misconduct. The minimum penalty for **cheating** on any course work will be a failing course grade.

**Disabilities:** Students with documented disabilities requiring accommodation during tests and exams or during lectures are encouraged to contact Disability Services at 786-9771 to discuss appropriate options.