

**DEPARTMENT OF PHYSICS & ASTRONOMY
TRENT UNIVERSITY**

PHYS 4600Y: QUANTUM MECHANICS 2011-12 FW
Peterborough

Instructors: Ralph Shiell (Fall Term) TBD (Winter Term)		Email: ralphshiell@trentu.ca
Office Location: SC 214 (RS)	Office Hour: Monday 10:00 – 11:00 (RS)	Telephone: 705 478 1011 x7023 (RS)

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Course Description:

Review of elementary quantum mechanics. States and operators in Hilbert space, Dirac notation, interpretative postulates, representations, symmetry transformations, angular momentum theory, spherically symmetric potentials, approximation methods.

Course Pre-requisites: PHYS 2620H (203H) *Atomic, Molecular and Nuclear Physics*
 PHYS-MATH 3150H (305H) *Partial Differential Equations*
 PHYS-COIS 3200Y (3210, 321) *Electricity and Magnetism*
 Excludes PHYS 400

Course Format:

Type	Day	Time	Location
Lecture	Tuesday	12:00 - 13:50	SC 317
Lecture & Tutorial	Thursday	11:00 - 12:50	SC 317

The second hour of the two-hour sessions scheduled on Thursday will normally involve tutorial-based work, concentrating on practice questions and the problem sets, or on the presentations (see below).

Course Evaluation:

Type of Assignment	Weighting	Due Date
Problem Sets	30% total	Every 1-3 weeks
Tests (2)	10% each	During class
Christmas Midterm	20%	Exam period
Final Exam	20%	Exam period
In-class presentations	5%	One per semester
In-class quizzes	5%	Weekly

In the second half of each semester everyone will give a short 5-minute summary of a Physics-related research article of their choice published in Nature or Science. Details of the article to be discussed must be sent to the instructor at least 48 hours before the presentation.

The in-class quizzes will take the form of one of three short tasks, provided ahead of time, and help ensure that everyone understands the basic material from a particular topic before moving onto the next topic.

Note that a minimum 40% average must be obtained on the tests, midterm, and final exam in order to pass this course. If the average is not met, then a grade of no more than 45% (i.e. an F) will be assigned for the course.

Required Texts: *Introductory Quantum Mechanics*, R. L. Liboff, Addison-Wesley (4th ed)

Late Policy:

Late assessments will be assessed a penalty of 25%, and will not be accepted more than 24 hours after they are due, except by prior arrangement or for a valid medical reason.

Note: Last date to withdraw from full year Fall/Winter courses in 2011-12 is February 7, 2012.

University Policies

Academic Integrity:

Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offence and carries penalties varying from a 0 grade on an assignment to expulsion from the University.

Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent University's *Academic Integrity Policy*. You have a responsibility to educate yourself – unfamiliarity with the policy is not an excuse. You are strongly encouraged to visit Trent's Academic Integrity website to learn more: www.trentu.ca/academicintegrity.

Access to Instruction:

It is Trent University's intent to create an inclusive learning environment. If a student has a disability and/or health consideration and feels that he/she may need accommodations to succeed in this course, the student should contact the Disability Services Office (BH Suite 132, 748-1281, disabilityservices@trentu.ca) as soon as possible. Complete text can be found under Access to Instruction in the Academic Calendar.

Class Sequence for Fall Semester (Approximate)

Week	Sections from Liboff	Topics
0	2.8, 3.1	Postulates of QM
1	3.2-3.4, 3.5, 4.1	Postulates; basic concepts
2	4.2-4.5	Hilbert spaces
3	5.1	Expansion of state functions
4	5.2-5.5	Commutation relations
5	6	Time evolution
6	to 7.3	Simple harmonic oscillator
7	All above	Test 1
8	7	Bound states in a finite well
9	7	Conservation of probability
10	11.1-11.3	Matrix representation
11	11.3-11.4	Unitarity, tilted SHO
12	Review	All above
Exam period	All above	All above

Topics to be covered in the **Winter Semester** will include much of Chapters 9, 10, 11 and 13, including:

Orbital angular momentum, raising and lowering operators, spherical harmonics and addition of angular momentum, precession in a magnetic field, MRI, the hydrogen atom, perturbation theory, variational method, radiation and selection rules.

A more complete calendar for Winter will be provided during the Fall semester.