

## CHM326: Introductory Quantum Mechanics & Spectroscopy Course Syllabus, Fall 2017

**Instructor:** Prof. Mark W.B. Wilson, Lash Miller Rm. 241, [mark.w.b.wilson@utoronto.ca](mailto:mark.w.b.wilson@utoronto.ca)

Note: *E-mail is preferred. Only messages originating from UofT accounts will garner responses.*

**Classes:** Monday & Friday, 2–3pm, Lash Miller Rm. 157

**Office Hours:** Monday, 3–4pm & Thursday, 3–4pm, Lash Miller Rm. 241

Note: *LM241 will be unavailable from Nov. 20th–Dec. 8th due to scheduled renovations.*

*A substitute location for the affected office hours will be posted on the Portal when confirmed.*

**Website:** The syllabus, assignments, and any course announcements will be posted on Blackboard (also known as the ‘Portal’). Log in with your UTORid at: <https://portal.utoronto.ca>

**Textbooks:** *Quantum Chemistry, 7th Ed.* — Ira N. Levine

([Reserve copy in Chem. library](#), [UofT Bookstore](#), [Pearson](#), [amazon.ca](#), [Free Online Solutions Manual](#))

**Alternate:** *Quantum Chemistry, 2nd Ed.* — Donald A. McQuarrie ([UofT Bookstore](#), [amazon.ca](#))

<b>Marking Scheme:</b>	5 Problem Sets	20%
	Midterm Test	20%
	Final Exam	60%

### Notes on assessment:

- Problem sets will be due at the *beginning* of class on Fridays (Sept. 22nd, Oct. 6th & 20th, Nov. 17th, & Dec. 1st). Assignments must be submitted in hand-written hard-copy, with your name & student number clearly indicated on the first page. The mark for a late problem set will be reduced by 25% if handed in before the beginning of class the following Monday, and by 50% if handed in afterwards. However, no marks will be awarded for any problem sets submitted after the beginning of our final class on Monday, Dec. 4th.
- The midterm will be Friday, October 27th, during class time. The test questions can be drawn from any material taught before this date.
- There are no make-up exams available for the Midterm Test or the Final Exam. Students who miss these exam dates may contact the course instructor to discuss their situation. The potential academic impacts of unforeseen illness or injuries will only be considered if the student presents a completed [Verification of Student Illness or Injury Form](#), signed by an appropriate medical professional.
- Students with diverse learning styles and needs are welcome in this course. Please discuss in-class accommodations and supports with the instructor. However, accommodations involving assessment will only be made on the advice of a University Disability Counsellor, who may require medical documentation. Accordingly, students are encouraged to register with [Accessibility Services](#) as soon as possible, to ensure that there is time to make arrangements.

### Academic Integrity:

Academic integrity is fundamental to learning and scholarship. Students are expected to be familiar with the University of Toronto’s [Code of Behaviour on Academic Matters](#)—particularly Section B.i.1., which gives examples of student actions considered an offence against the Code.

(Continued overleaf...)

**Summary of Course Aims:**

CHM326 concerns the *mechanics* of quantum mechanics. The motivating goal for you to be able to confidently use the standard tools and fundamental conceptual frameworks of quantum mechanics to describe, solve, and interpret problems, and thereby construct and hone your intuition for quantum phenomena in chemistry.

**Syllabus:**

1. Introduction
2. Operators (Levine, Chapter 3)
3. Theorems of Quantum Mechanics (Levine, Chapter 7)
4. Applying new tools to the particle-in-a-box (Levine, Chapters 2 (Review of 1D) & 3.3–3.8)
5. The Harmonic Oscillator (Levine, Chapter 4)
6. Angular Momentum (Levine, Chapter 5)
7. The Hydrogen Atom (Levine, Chapter 6)
8. The Variational Method (Levine, Chapter 8)
9. Perturbation Theory (Levine, Chapter 9)

*Additional topics that we may address but are not extensively covered:*

1. Time evolution in quantum mechanics
2. Electron spin (Levine, Chapter 10)
3. Many-electron atoms (Levine, Chapter 11)
4. Electronic structure of diatomic molecules (Levine, Chapter 13)
5. Molecular Symmetry (Levine, Chapter 12)

*Associated topics that we will not cover:*

1. Time-dependent effects (See CHM423)
2. Applications in molecular dynamics and transport (CHM423, PHY2303)
3. Hilbert space formulation of quantum mechanics (CHM1478)
4. Photon statistics, laser spectroscopy, & photophysics (CHM1482)
5. Relativistic quantum mechanics (PHY2403)
6. Many-body effects (PHY2321)
7. Philosophical interpretations of quantum mechanics (PHY1491)
8. ... and the role of quantum mechanics in neurophilosophy and the problem of free will.  
(Though I'd recommend [John Searle's book](#) if you are interested!)