Trent University Physics 5900H
Advanced Topics: Molecular Physics: 2008-2009

1. Instructor Information:

Ralph Shiell, Physics (Lab SC214, Office SC213), ralphshiell@trentu.ca, 748 1011 x7023

2. Course Information: This one-semester course covers the application of quantum mechanics to molecules, with an emphasis on the physics of diatomic molecules. It is based primarily on P. Bernath's *Spectra of Atoms and Molecules* book, with background and related material brought in from other sources. The course will be delivered in a lecture format with one 2 hour lecture each week over a 12 week period.

3. Timetable:

To be determined. The course will be delivered in a lecture format with class readings and one 2 hour lecture each week over a 12 week period.

4. Prerequisite(s)/Co-requisite(s):

Prerequisite: Physics 400 (Quantum mechanics), or an equivalent upper-level course in quantum mechanics

5. Textbooks:

Required : P. F. Bernath, *Spectra of Atoms and Molecules*, 2nd edition (2005)
Recommended : J. L. Seinfeld, *Molecules and Radiation*, 2nd edition (1986)
: P. W. Atkins and R.S. Friedman, *Molecular Quantum Mechanics*, 3rd edition (1998)
: J. Brown and A. Carrington, *Rotational Spectra of Diatomic Molecules,* 1st edition (2003)

6. Course webpage: http://www.trentu.ca/academic/physics/rshiell/Phys5900Hdir/Phys5900H.html

7. Course Outline:

1. Quantum mechanics background (operators, Dirac notation, many electron wave functions, angular momentum, selection rules)

2. Atomic physics background (one-electron and multi-electron atoms, interaction with external fields, hyperfine structure)

3. Diatomic molecules (Born-Oppenheimer approximation, electric and magnetic properties, rotational, vibrational and electronic spectroscopy)

4. Group theory and polyatomic molecules (symmetry point groups, and polyatomic spectroscopy)

8. Assessment:

Assignments (5)	40 %
Term paper	20 %
Final Exam	40 %

Grading will be based on five assignments throughout the course, a term paper on a subject chosen from a list of topics agreed with the instructor, and an unseen final exam.

9. Late Submission of Assignments:

Within 24 hours: the mark awarded will be the percentage marked minus 10 (but greater than or equal to zero). More than 24 hours late: a zero mark.

10. Academic Dishonesty

Academic dishonesty, which includes plagiarism and cheating, is an extremely serious academic offense and carries penalties varying from failure in an assignment to suspension from the University. Definitions, penalties, and procedures for dealing with plagiarism and cheating are set out in Trent University's Academic Dishonesty Policy which is printed in the University Calendar.

11. 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 (BL Suite 109, 748-1281, disabilityservices@trentu.ca) as soon as possible. Complete text can be found under Access to Instruction in the Academic Calendar.