PHY 294S – QUANTUM AND THERMAL PHYSICS
DEPARTMENT OF PHYSICS, UNIVERSITY OF TORONTO
WINTER 2012

This course will be taught in two halves: quantum physics (9 Jan. - 1 March.) and thermal physics (2 March - 13 Apr.). The individual syllabi for the two halves are given on the following pages. The general course, tutorial and laboratory information is given on this page.

COURSE WEBSITE: on the Portal.

COURSE COORDINATOR: Dr. Pierre Savaria, MP129E, 416 978 4135
Course email: phy294h1@physics.utoronto.ca
Please use this address for matters relating to course administration such as grading and teaching assistants.

LECTURES: LEC0101: M 16:00-17:00, R 15:00-16:00, and F 10:00-11:00:
LEC0102: W 9:00-10:00, R 14:00-15:00, and F 9:00-10:00

COURSE EVALUATION:

10 %	Problem sets (best 4 out of 6)
30 %	2 Midterm Tests (each 60 minutes)
20 %	Laboratories
40 %	Final Exam (2.5 hours)

TESTS AND EXAM:

- Midterm Test 1: Thursday February 16 at 9:30-10:30 AM; Room EX100
- Midterm Test 2: Monday March 19 at 9:30-10:30 AM; Room EX100
- Final Exam: TBA (time to be scheduled by Faculty during April exam period)

TUTORIALS (Beginning Thursday 19 January, led by teaching assistants in rooms listed):

Section 01:	Thu	13:00 – 14:00	BA2159	(Matin Hallaji)	drop-box 39
Section 02:	Thu	13:00 – 14:00	BA2139	(Andreea Lupascu)	drop-box 40
Section 03:	Thu	13:00 – 14:00	BA3008	(Lee Rozema)	drop-box 38
Section 04:	Thu	13:00 – 14:00	BA3012	(Vijay Venkataraman)	drop-box 37
Section 05:	Thu	11:00 – 12:00	BA2159	(Matin Hallaji)	drop-box 39
Section 06:	Thu	11:00 – 12:00	BA3008	(Andreea Lupascu)	drop-box 40
Section 07:	Thu	11:00 – 12:00	BA2139	(Lee Rozema)	drop-box 38
Section 08:	Thu	11:00 – 12:00	BA3116	(Vijay Venkataraman)	drop-box 37

PRACTICALS WEBSITE: http://www.physics.utoronto.ca/~phy294lab/
Alternate weeks in room MP222 with starting dates indicated below:

Section PRA 01:	Wed. Jan. 18	9:00 – 12:00	Section PRA 02: Wed. Jan. 18 14:00 – 17:00
Section PRA 03:	Wed. Jan. 25	9:00 – 12:00	Section PRA 04: Wed. Jan. 25 14:00 – 17:00

PROBLEM SETS:

1) Problem sets will be posted on the course website approximately a week prior to the due date. No paper copies of the problem set will be distributed in class. Problem sets are to be handed in to the course drop box in the basement of the McLennan Physical Labs by the time and date listed on the assignment. Late problem sets will not be accepted.
2) Only one or two questions will be selected from the problem set for marking by the teaching assistants.
3) The best four marks of the six problem sets will be used to determine the final mark.

PHY294S – QUANTUM PHYSICS SECTION

LECTURER: Prof. Robin Marjoribanks
Office / Tel.: Room MP 1104C/ 416 978 6769
E-mail: marj@ physics.utoronto.ca
Office hours: to be discussed in first lecture, according to your schedules.

EMAIL POLICY: I will reply to email inquiries from students within two business days (excluding weekends), and usually within one. I **won't** answer detailed questions about physics problems by e-mail, as these are better addressed in person.

TEXTBOOK: *Modern Physics* (2nd edition), Randy Harris (Pearson Addison-Wesley)

COURSE NOTES: We'll follow the course text quite closely; additional material including notes will be posted when it does not repeat the text, or is extra to the text; summaries of the key issues and points of each lecture will be posted. I do strongly encourage students to solidify their learning by their own good note-taking in lecture.

TENTATIVE COURSE OUTLINE:

- For each lecture listed below, the corresponding section(s) in the textbook (Harris) are given where applicable. Material in the textbook not covered in the lectures is not examinable unless explicitly stated in class.
    1) Review: weirdness of quantum mechanics – waves and particles [§3.1–4.2]
    2) Making it mathematical: Schrödinger's equation and implications [§4.3, 4.4, 4.7]
    3) Uncertainty of waves: the Uncertainty Principle and the Fourier Transform [§4.7]
    4) Bound systems in 1D: Schrödinger's equation, bound states, particle in a well [§5.1–5.6]
    5) More bound systems: the Simple Harmonic Oscillator and Why [§5.7]
    6) Expectations, Uncertainties, Operators [§5.8–5.11]
    7) More-formal representation: Connection with Vector Spaces [mostly off-text]
    8) More-formal representation: Well-defined observatbles, Eigenfunctions, Eigenvalues [§5.11]
    9) Unbound states: potential steps, potential barriers, tunnelling [§6.1–6.3]
    10) Particle-wave propagation: phase speed, group speed, dispersion [§6.4 and off-text]
    11) QM Sytems in 3D: Schrödinger Equation, particle in box [§7.1–7.2]
    12) Energy quantization and spectroscopy of hydrogen (empirical/phenomenological) [§7.3]
    13) Schrödinger Equation for a central force, quantization of angular momentum [§7.4–7.5]
    14) The Hydrogen atom, radial probability [§7.6–7.8]
    15) Quantization of angular momentum and the Stern-Gerlach experiment [§8.1]
    16) Identical particles, and spin [§8.2]
    17) The Pauli Exclusion Principle [§8.3]
    18) More about pectra, adding angular momenta and coupling [§8.4–8.9]

PHY294S – THERMAL PHYSICS SECTION

LECTURER: Prof. John Y. T. Wei
Office / Tel.: Room MP 081 / 416 946 5943
E-mail: wei@physics.utoronto.ca
Office hours: By appointment

EMAIL POLICY: I will reply to email inquiries from students within two business days .

TEXTBOOK (copies available on short-term loan from Physics and Gerstein libraries):

An Introduction to Thermal Physics (1st edition), Daniel V. Schroeder(Addison Wesley Longman)

TENTATIVE COURSE OUTLINE:

This course will generally follow the textbook and will cover most of Chapters 1-3 and 6-7. No prior knowledge of statistical physics is assumed. However, I will assume that you are familiar with thermodynamic concepts such as entropy, etc.

For each lecture listed below, the corresponding section(s) in the textbook are given.

1. Overview of statistical mechanics
2. Temperature and review of thermodynamics (1.1 – 1.4; 1.6)
3. Two-state system and multiplicity (2.1 – 2.3)
4. Large systems and multiplicity (2.4)
5. Entropy (2.6)
6. Temperature and entropy (3.1 – 3.2)
7. Paramagnetism (3.3)
8. Pressure and thermodynamic identity (3.4)
9. Boltzmann factor and partition function (6.1)
10. Paramagnetism revisited (6.2)
11. Partition function and free energy (6.5 – 6.6)
12. Ideal gas (6.7)
13. Blackbody radiation (7.4)
14. Blackbody radiation continued (7.4)
15. Debye theory of solids (7.5)
16. Chemical potential and Gibbs factor (7.1)
17. Quantum statistics (7.2)
18. Degenerate Fermi gases (7.3)