CHM 8309 G00
Introduction to Statistical Mechanics
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Study materials: -Lecture presentations are posted on-line;
-Extended discussions for some sections of the course are in my book:
Molecular Simulations: Fundamentals and Practice (see UOttawa Library)
-Please note list of typos on my website.
-Older versions of the slides with voice recording are on my website

Useful textbooks:

- Donald A. McQuarrie, Statistical Mechanics or Statistical Thermodynamics
- Terrell Hill, Introduction to Statistical Thermodynamics
- Mark Tuckerman, Statistical Mechanics: Theory and Molecular Simulation

Background material used:

- Undergraduate physics (mechanics) and calculus
- Familiarity with probability theory
- Thermodynamics at the level of undergraduate physical chemistry
- Quantum mechanics of simple systems (particle in a box, harmonic oscillator, rigid rotor, Pauli exclusion principle)

Topics covered

- Introduction to classical mechanics / the Lagrangian and Hamiltonian approaches / phase space

- Review of some simple quantum mechanical systems

- Introduction to probability theory: Discrete variable distributions / continuous variable distributions / the Central Limit Theorem

- The Maxwell-Boltzmann distribution

- The method of Lagrange multipliers

- The concept of ensemble

- Derivation of the quantum mechanical partition function: Canonical ensemble / isothermal – isobaric ensemble / grand canonical ensemble

- The partition function for ideal gas systems: Translation / rotational / vibrational partition functions

- Statistical mechanics of solids, adsorption, ...

- Classical statistical mechanics and MD simulations