CHM 6461: Introduction to Statistical Thermodynamics, Fall 2014

Instructor: Prof. Russ Bowers
Email: bowers@chem.ufl.edu
Office: Physics Building, Room 2346
Office Hours: To be determined.
Meeting Place and Time: MWF 2nd Period (8:30-9:20), Leigh 104 (Subject to change)

Classes begin/end: August 25/December10

Holidays, no class meetings
Monday, September 1: Labor Day
Friday, October 17: Homecoming
WednNovember 26-28: Thanksgiving break

Grading scheme

Midterm Exam	35%
Final Exam	35%
In-class quizzes	30%

Quizzes: There will be 5 (unannounced) in-class quizzes. The best 3/5 will be used in grade calculation.
Homework: Will be regularly assigned but not collected or graded.

Texts

1. Michel Le Bellac, Fabrice Mortessagne and G. George Batrouni, Equilibrium and Non-Equilibrium Statistical Thermodynamics, Cambridge University Press (available as ebook), eISBN: 9780511193705
2. Donald A. McQuarrie, Statistical Mechanics (Hardcover), Publisher: University Science Books; 2nd edition (May 2000), ISBN-10: 1891389157, ISBN-13: 978-1891389153
3. Terrell L. Hill, An Introduction to Statistical Thermodynamics (Paperback and available as e-book), Dover Publications (January 1, 1987) ISBN-10: 0486652424, ISBN-13: 978-0486652429

Tentative Schedule

Weeks 1-2	Unit 1: Thermostatics Review Microscopic and macroscopic variables Work, heat, internal energy Thermal equilibrium Postulate of maximum entropy Intensive variables Maximum work, heat engines Thermodynamic potentials Specific heats Gibbs-Duhem relations Statbility condition Third Law
Weeks 3-5	Unit 2: Statistical entropy and Boltzmann distributions Time evolution in quantum mechanics Density operators and time evolution Quantum phase space P,F,E relation for a monatomic ideal gas Statistical entropy Time Evolution of statistical entropy Equilibrium distributions Legendre transformations Canonical and grand canonical ensembles Heat and work Entropy and temperature: 2nd Law Entropy of mixing Pressure and chemical potentials Irreversibility and growth of entropy
Weeks 6-8	Unit 3: Canonical and grand canonical ensembles Mean values and fluctuations Partition function and ideal gas Paramagnetism

	Ferromagnetism andIsing Model Classical statistical mechanics Maxwell distributions Equipartition theorem Partition function of diatomic and polyatomic molecules Chemical Potentials Coexistence of phases
Weeks 9-11	Unit 4: Quantum Statistics Bose-Einstein and Fermi-Dirac distributions Grand partition function Maxwell-Boltzmann classical limit Ideal Fermi gas Debye model: simple model of vibrations in solids Spin waves and spin-wave dispersion in 1D
Weeks 12-15	Unit 5: Chemical Equilibrium Rates of chemical reactions Absolute rate theory