

PHYS 441 Course Outline
Instructor: Steve Pressé

Grading: 60 is the passing grade. 30% 2 Midterms, 30% Problem Sets, 40% Final.

The lowest problem set (out of 11) and the lowest midterm (out of 2) will not be counted toward your final grades. For this reason, no excuse will be accepted for late or missing problem sets or midterms. Under exceptional circumstances, we will deal on a case by case basis with students unable to make both midterms. Students may form study groups to work on problem sets which will be assigned about every week. However, all students must write-up their own solutions. Problem sets are due at 4pm on the due date; late problem sets are **not** accepted. Solutions will be posted online.

If students miss the final exam (under the most exceptional of circumstances that can be substantiated), this will be dealt with on a case by case basis.

Office Hours:

WF – 10:30-11:30 - Brandon Sumner (TA), bsumner1@asu.edu, PSF 186

F – 11:45-12:45 or by email request - Steve Pressé (Instructor), spresse@asu.edu, PSF 350

Required text:

Schroeder, An Introduction to Thermal Physics, 2000.

Helpful texts:

Hogg and Tanis, Probability and Statistical Inference, 2001.

Bishop, Pattern Recognition and Machine Learning, 2006.

Kittel and Kroemer, Thermal Physics, 1980.

Class Schedule

Thermo

Week 1 (Aug 18th):

Lecture 1 – Ideal gas (1.2), First law: heat and work (1.4) – Nothing due.

Week 2 (Aug 21st - Aug 25th):

Lectures 2-4 – Carnot cycle, heat capacities (1.5-1.6, 4.1-4.2) – PSET 1 due (Friday 4pm).

Week 3 (Aug 28th - Sep 1st):

Lectures 5-7 – Second law, entropies of mixing (2.1, 2.4-2.6) – PSET 2 due (Friday 4pm).

Week 4 (Sep 6th - Sep 8th):

Labor Day, Lectures 8-9 – Temperature, equilibrium and potentials (3.1-3.2, 3.4-3.6) – PSET 3 due (Friday 4pm).

Week 5 (Sep 11th - Sep 15th):

Lectures 10-12 – Enthalpy, Helmholtz free energy, Gibbs free energy, Maxwell and cyclic relations (5.1-5.2) – PSET 4 due (Friday 4pm).

Week 6 (Sep 18th - Sep 22nd):

Lectures 13-14, Midterm 1 (Friday) – Phase transformations (5.3) – Nothing due.

Statistics

Week 7 (Sep 25th - Sep 29th):

Lectures 15-17 – Continuous and discrete random variables, coin flips, Stirling's approx. and distributions – PSET 5 due (Friday 4pm).

Week 8 (Oct 2nd - Oct 6th):

Lectures 18-20 – Probabilities, moments, central limit theorem and likelihoods – PSET 6 due (Friday 4pm).

Week 9 (Oct 11th - Oct 13th):

Fall Break, Lecture 21 – Bayes' theorem, posteriors and parameter estimation – Nothing due.

Week 10 (Oct 16th - Oct 20th):

Lectures 22-24 – Maximum entropy, density estimation and model selection – PSET 7 due (Friday 4pm).

Statistical physics

Week 11 (Oct 23rd - Oct 27th):

Lectures 25-27 – Boltzmann statistics and partition functions for discrete systems (6.1-6.2) – PSET 8 due (Friday 4pm).

Week 12 (Oct 30th - Nov 3rd):

Lectures 28-30 – Boltzmann weights and partition functions for continuous systems (2.5), Maxwell distribution (6.4) – PSET 9 due (Friday 4pm).

Week 13 (Nov 6th - Nov 8th):

Lectures 31, Midterm 2 (Wednesday), Veterans Day – Classical statistical mechanics (6.5-6.7) – Nothing due.

Week 14 (Nov 13th - Nov 17th):

Lectures 33-35 – Quantum statistics, bosons and fermions (7.1-7.2) – PSET 10 due (Friday 4pm).

Week 15 (Nov 20th - Nov 22nd):

Lectures 36-37, Thanksgiving – Applications of quantum statistics (7.3-7.5) – Nothing due.

Week 16 (Nov 27th - Dec 1st):

Lectures 38-39, no lecture on Dec 1st – examples – PSET 11 due (Friday 4pm).

Week 17 (Dec 4th - Dec 9th):

Final Exam.

