PHYSICS 400
Statistical and Thermal Physics
Davidson College
Fall 2009

Professor John Yukich **Dana 169**
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TEXT: Thermal Physics, Daniel Schroeder, 1st ed, Addison-Wesley.

PREREQUISITES: Physics 330 or consent of instructor.

LECTURE: Tues/Thurs 11:30 AM – 12:45 PM, Dana B071.

OFFICE HOURS: will be posted on my webpage; however, I will generally be available any time my door is open.

OBJECTIVES: This course will address the major topics in the very broad physics subfield of thermodynamics and statistical mechanics. Topics will include energy, the 2nd law, entropy, interactions, heat engines, refrigerators, phase transitions, and Boltzmann and quantum statistics. Attention will be given to proper mathematical treatment of these topics. Whenever possible, connections will be made in lecture to applications. The course is intended to help prepare students for further study in physics and/or engineering.

ATTENDANCE: You are expected to attend each class unless you have a legitimate reason for being absent. In this case, please see me in advance (except in the case of illness). *You are also expected to attend all department seminars*! Remember, you are "writing your own letter of recommendation."

ASSIGNMENTS: There will be regular assignments of problem sets taken from the textbook. These assignments, and their solution keys, will be posted on the course web page. I urge you to work together on the assignments as much as possible. However, each student's work turned in for grading must be a product of that individual student's understanding of the material; i.e., *you may not copy work from another student in this class or any previous class, or any book, website, or other external resource. Copying any solution, or portion thereof, other than those found in your textbook or discussed during office hours is an honor code violation.*

GRADING: Homework assignments 45%, reviews 35%, final exam 20%. The two reviews will each be a combination of take-home and in-class, time-limited, closed-book tests. The final will be a comprehensive, take-home, time-limited, closed-book examination taken during final exam week.

WEEK OF	TOPICS	CH
Aug. 24 - Aug. 28	Thermal equilibrium, ideal gases, energy	1
Aug. 31 – Sept. 4	Heat, work, heat capacities	1
Sept. 7 – Sept. 11	Second law, two-state systems, Einstein model, large systems	2
Sept. 14 – Sept. 18	Large systems, ideal gas, entropy	2
Sept. 21 – Sept. 25	Temperature, entropy and heat, paramagnetism	3
Sept. 28 – Oct. 2	Paramagnetism, mech. equilibrium, pressure	3
Oct. 5 – Oct. 9	Carnot cycle heat engines, refrigerators	4
Oct. 12 – Oct. 16	Real heat engines (No class Oct. 13)	4
Oct. 19 – Oct. 23	Real refrigerators; Free energy	4 - 5
Oct. 26 – Oct. 30	Free energy, phase transformations	5
Nov. 2 – Nov. 6	Phase transformations; Boltzmann factor, average values	5 - 6
Nov. 9 – Nov. 13	(No class Nov. 12) Equipartition theorem, Maxwell distribution	6
Nov. 16 – Nov. 20	Partition functions, free energy, ideal gases	6
Nov. 23 – Nov. 27	(No class Nov. 26) Gibbs factor, bosons/fermions	7
Nov. 30 – Dec. 4	Fermi gases, BB radiation	7
Dec 7 – Dec. 9	Debye theory, Bose-Einstein condensation	7
Dec. 11	Final Begin	

N.B.: The above outline is a *rough approximation* of the schedule. Adjustments may be necessary, but I will give ample advance notice before changes are made.