PHYS-4200: Statistical and Thermal Physics

Course description

A course in advanced classical and statistical thermodynamics. Topics include energy in thermal physics; entropy and the Second Law; engines and refrigerators; free energy and chemical thermodynamics; Boltzmann statistics, quantum statistics, and applications.

Lectures are MWF 12:30 - 1:40 in Bann 403.

No lab component to course.

Professor

Dr. Steve Andrews
e-mail: andrewss@seattleu.edu
office: Bann 319

office hours: I will usually be in my office MWF mornings and many afternoons. I'm happy to arrange specific meeting times.

Prerequisite courses

PHYS-2030 (Thermodynamics)
PHYS-2050 (Mathematical Methods for Physicists)
MATH 2340 (Differential Equations)

Textbook and other resources

Textbook: Reif, *Fundamentals of Statistical and Thermal Physics*

This text was originally published in 1965. There are new printings, but they are completely identical to the original text, so feel free to purchase old copies.

All resources are allowed for homework, including internet searches, use of MatLab and/or Mathematica, etc. I recommend Mathematica.

Grading

Grades will based on weekly homework (~20%), a midterm exam (~30%), a final exam (~30%), and a final project (~20%). I expect that the class average will be around a B+.

Late assignments will receive an automatic 1 point deduction.

Final projects

Students will prepare a final project at the end of the course, including a term paper and an oral presentation of it to the class. Topics should be about statistical and thermal physics, but are wide open otherwise. Here are some examples.

Broad topics (probably most references would be to textbooks)

- non-equilibrium statistical mechanics
- statistical mechanics of solid state physics
- Bose-Einstein condensates
- density matrices (for quantum mechanics with superpositions)

Narrowly focused topics (probably most references would be from journal articles)

- the structure of liquid water
- entropy of black holes
- thermodynamic limits to computation

Original research

- something related to a project that you are already working on
- a new project (let me know if you want suggestions)

Enrolled students

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