Material for Week 8
Physics 4488/6562: Statistical Mechanics
http://www.physics.cornell.edu/sethna/teaching/562/
Exercises due Mon. Apr 06
Last correction at April 20, 2020, 6:00 pm

On Friday and next Monday, you will be running simulations in class. Please bring your laptops, tablets, or smart phones.

Monday
In-class question: 7.24 *Is sound a quasiparticle?*
In-class question: 7.12 *Semiconductors*
Wednesday
Read: Chapter 7, Sec. 7.6 (Black body radiation and Bose condensation), and Sec. (7.7) (Metals and the Fermi gas).
Pre-class question: 7.22 *Light baryon superfluids*
In-class question: 7.2 *Phonons and photons are bosons*
In-class question: 7.23 *Why are atoms classical?*
Friday
Read: Chapter 8, Sec. (8.1) (The Ising model)
Pre-class question: 8.16 *Ising hard disks*
In-class question: 8.1 *The Ising model*
In-class question: 8.17 *Ising parallel updates*
Monday
Read: Chapter 8, Sec. (8.2) (Markov Chains)
Pre-class question: 8.3 *Coin flips and Markov*

Exercises

Everyone (4488 and 6562)

7.16 *White dwarfs, neutron stars, and black holes.*
8.2 *Ising fluctuations and susceptibilities.*

Graduate (6562 only)

7.9 *Bosons are gregarious: superfluids and lasers.* Just as in 'Quantum dice', the wavefunction symmetry of noninteracting Bosons lead them to cluster into the same single-particle state. By condensing into a propagating single-particle state (not the ground state), they explain both supercurrents in superfluids and lasers. You also will explore population inversion, needed for laser operation.
7.14 *Bose condensation: the experiment.* In 1995, Bose condensation was observed for the first time. You can reproduce their experimental analysis.