Physics 114: Syllabus - Topics and Recommended Reading

Week	Topic	G&T	B&B
0	Tools we'll need: Math: Functions of > 1 variable, partial derivatives Computer: Accessing iPython and G&T simulations	2.24.1	C.6, C.7
1	From micro to macro, 0th and 1st laws, Equilibrium, Heat capacity	1 and 2.1-2.11	1.1-1.3, 2, 11, 12
2	2nd and 3rd laws, Entropy, Heat engines	2.12-2.20, 2.23.1	13, 14.1-14.4 , 18
3	Free energy, Thermodynamic potentials, Maxwell relations, Math: Legendre transforms	2.21-2.22, 2.23.2, 2.24.2	16, 26.1 to middle of p. 299, 27
4	Probability theory, Counting microstates Math: Lagrange multipliers, Stirling's approx, ...	3.1-3.7*, 3.11.1, 4.1	1.4, 3, C.1-C.3, C.13
5	More state-counting, Statistical basis for S and T, Microcanon. and Canonical ensembles, State functions Applications: harmonic oscillator, ideal particles in boxes	3.4.2, 4.2-4.7, 4.13, 4.14.1, 4.14.2	4.1-4.6, 14.5-14.8, 15 C.8
6	Simulations and applications: Oscillators and semiclassical ideal gas, Equipartition, Maxwellian distribution	4.8-4.11 6.1, 6.2	4.7, 5 19, 20, 21
7	Kinetic theory: Pressure, Transport of Mass and Energy		6-10

* We'll save section 3.4.2 for Week 5.

Week	Topic	G&T	B&B	Schroder
8	Grand Canonical ensemble, Density of states, Chemical potential and reactions	4.12, 6.5, 6.6, 6.11.1, 7.1, 7.2 and 7.5	22	7.1
9	Para- and ferromagnets, Ising model	5.1-5.9	Example 20.5, 28.8	8.2
10	Counting bosons and fermions, Black body radiation, Einstein and Debye solids	6.3-6.5.1, 6.7, 6.9	23, 24, 29, 30.1, C.4, C.5	7.2, 7.4, 7.5
11	Fermi and Bose gasses, BEC, Ultra Relativistic Gas	6.8, 6.10, 6.11.2	30.2 - 30.4 25	7.3, 7.6, 25
12	Real gasses Phase equilibria and transitions	8.1-8.3, 8.5 to top of p 436 7.1-7.4	26.1, 26.3, 26.4, 28.1-28.7	8.1 5.3-5.4 (to top of p.195)

Please note:

- *If you closely read everything on this syllabus, you'd get phenomenal insight into thermo and stat mech. But time is limited and remote learning is tough.* **Reading everything listed above is not required in order to do an excellent job in this seminar.**
- *On our Moodle site* **I will give you guidance as to what is a "must-read", and what you might skip***, to let you trim your reading time if needed.*
- *At the other end of the spectrum: Our Moodle site* **might suggest references for further enrichment** *(videos, readings, ...). It will have links to these electronic docs and other media.*