

PHYS 552 Statistical Physics			
2014 Spring Syllabus			
Week	Dates	Main topics	Additional information
1	5.2-7.2	Introduction	Syllabus/Advertise Colloquia/Begin Chapter 21
2	10.2-14.2	Thermostatistics	Microscopic/macrosopic states, work, heat, equilibrium, metastability, entropy function, internal constraints
3	17.2-21.2	Thermostatistics	Thermodynamics potentials, stability, Massieu functions
4	24.2-28.2	Statistical Entropy and Boltzmann distribution	Quantum description, classical description, statistical entropy
5	3.3-7.3	Statistical Entropy and Boltzmann distribution	Boltzmann distribution, Irreversibility, growth of entropy
6	10.3-14.3	Canonical and Grand Canonical Ensembles	Classical statistical mechanics, quantum oscillators and rotators
7	17.3-21.3	Canonical and Grand Canonical Ensembles	Ideal gases and liquids, chemical potential, grand canonical ensemble
8	24.3-28.3	Critical phenomena	Ising model, mean-field theory, Landau theory
9	31.3-4.4	Critical phenomena	Renormalization group
10	7.4-11.4	Quantum Statistics	Bose Einstein distribution, Fermi Dirac distribution, ideal Fermi gas
11	14.4-18.4	Quantum statistics	Ideal Bose gas, superfluidity, superconductivity
12	21.4-25.4	Non-equilibrium statistical mechanics	Linear response theory, memory effects
13	28.4-2.5	Non-equilibrium statistical mechanics	Langevin, Fokker-Planck equations
14	5.5-9.5	Irreversible processes: macroscopic theory	Flux, affinities, hydrodynamics
15	12.5-16.5	Irreversible processes: kinetic theory	Boltzmann equation, transport

**Course textbook:** M. LeBellac, F. Mortessagne, G.G. Batrouni, *Equilibrium and Non-Equilibrium Statistical Thermodynamics*, Cambridge University Press (2006).

**Other recommended textbooks:**

- L. Reichl, *A Modern Course in Statistical Physics*, Wiley-VCH (2009).
- M. Pliscke and B. Bergersen, *Equilibrium Statistical Physics*, World Scientific (2006).
- R. K. Pathria and P.D. Beale, *Statistical Mechanics*, Academic Press (2007).

**Course Grade:**

In-class exams 50% Final 50% The final exam is divided into a written and an oral part, each weighing 25%.

**Exam dates:**

1. In-class exams will take place during the spare (or fourth) hour. There will be ca. 5 or 6 of them
2. Final Exam: to be announced

**Web Page:** [www.bilkent.edu.tr/~hetenyi/PHYS552/](http://www.bilkent.edu.tr/~hetenyi/PHYS552/)

**Attendance:** Attendance will be taken for each day.