

Tue	16.4	<b>Laws of thermodynamics:</b> first law and different kinds of work (*, 1.1)	L1
Thu	18.4	postulates of Kelvin and Clausius, Carnot engine, temperature (*, 1.2 & 1.3)	L2
Fr	19.4	no recitation	-
Tue	23.4	second law and entropy (*, 1.4)	L3
Thu	25.4	the mathematics of thermodynamics (*, appendix A)	L4
Fr	26.4	no recitation	-
Tue	30.4	<b>Thermodynamic functions:</b> internal energy and enthalpy (*, 2.1)	L5
Thu	2.5	free energy and free enthalpy (*, 2.3); extensive and intensive quantities (*, 2.4)	L6
Fr	3.5	1. recitation	R
Tue	7.5	<b>Equilibrium and stability:</b> application of the principle of maximum entropy (*, 3.1)	L7
Thu	9.5	-- holiday --	-
Fr	10.5	2. recitation	R
Tue	14.5	chemical potential, chemical equilibrium (*, 3.2)	L8
Thu	16.5	<b>Simple phase diagrams:</b> phase rule, van der Waals theory (*, 3.1 / 4.1)	L9
Fr	17.5	3. recitation	R
Tue	21.5	-- holiday --	-
Thu	23.5	-- holiday --	-
Fr	24.5	-- holiday --	-
Tue	28.5	<b>Ensemble theory &amp; microscopic interactions:</b> canonical ensemble and its generalization (*, chap 5; **, 2.2 / 2.3)	L10
Thu	30.5	-- holiday --	-
Fr	31.5	4. recitation	R
Tue	4.6	<b>Systems without direct interaction:</b> gases of photons and phonons (**, 3.1 / 3.2)	L11
Thu	6.6	Bose-condensation (**, 2.5)	L12
Fr	7.6	5. recitation	R
Tue	11.6	free electron gas (**, 2.5)	L13
Thu	13.6	<b>Classical partition functions:</b> atomic and molecular gases (**, 2.1 / 3.4)	L14
Fr	14.6	6. recitation	R
Tue	18.6	virial expansion, generalized equipartition theorem (**, 2.1)	L15
Thu	20.6	<b>Fluctuation theory:</b> energy fluctuations (*, 5.16/5.17), Einstein-fluctuation theory (**, 5.1)	L16
Fr	21.6	7. recitation	R
Tue	14.6	example: thermally fluctuating membrane (**, 5.2)	L17
Thu	27.6	<b>Critical phenomena</b> (**, 6.1 – 6.7): Ginsburg-Landau mean-field theory, spontaneous symmetry breaking	L18
Fr	28.6	8. recitation	R
Tue	2.7	critical fluctuations, scaling hypothesis	L19
Thu	4.7	renormalization group ideas	L20
Fr	5.7	9. recitation	R
Tue	9.7	<b>Selected topic</b> – computer simulation: Metropolis Monte Carlo (**, chap. 7)	L21
Thu	11.7	<b>Selected topics</b> – polymer physics: rubber elasticity (*, 5.1 2 <sup>nd</sup> ed.)	L22
Fr	12.7	10. recitation	R
Tue	16.7	the transfer matrix method applied to polymers (**, 8.1)	L23
Thu	18.7	<b>Selected topic</b> – cosmology: equation of state of the universe (***, chap. 9)	L24
Fr	19.7	final exam	R

**Literature:**

- (\*) R. Hentschke, Thermodynamics, Springer, 2014 (English)  
(\*\*) R. Hentschke, Statistische Mechanik, Wiley-VCH, 2004 (German)  
(\*\*\*) R. Hentschke and Ch. Höbbling, A Short Course in General Relativity and Cosmology, Springer, 2020 (English)