

Thermal and Statistical Physics I

CLASS DATE		TOPICS	HOMEWORK DUE DATES	CALLEN READINGS (READ AHEAD)
JAN	12	INTRODUCTORY COMMENTS, COURSE OUTLINE		
	14	THE FOUR POSTULATES:		1.1-6
	16	THE BASIC PROBLEM OF THERMODYNAMICS		1.7-10
	19	<i>MARTIN LUTHER KING DAY – NO CLASS</i>		
	21	CONDITIONS OF EQUILIBRIUM: EQUATIONS OF STATE		2.1-3
	23	KINDS OF EQUILIBRIUM (MECHANICAL, THERMAL, CHEMICAL)		2.4-9
	26	FORMAL RELATIONS; IDEAL GAS	1: CHAP 1-2	3.1-4
	28	VAN DER WAALS FLUID, ELECTROMAGNETIC RADIATION, RUBBER BAND		3.5-7
	30	MAGNETIC SYSTEMS, HEAT CAPACITY AND OTHER DERIVS		3.8-9
FEB	2	REVERSIBLE PROCESSES: HEAT ENGINES	2: CHAP 3	4.1-4
	4	MAXIMUM WORK THEOREM, CARNOT AND OTHER THERMODYNAMIC CYCLES		4.5-10
	6	ALTERNATE FORMULATIONS VIA LEGENDRE TRANSFORMATIONS		5.1-2
	9	EXAM, CHAPTERS 1-3 (BAND ROOM, 7-9 PM; REVIEW DURING CLASS)	EXAM 1	
	11	THERMODYNAMIC POTENTIALS		5.3-4
	13	HELMHOLTZ, GIBBS POTENTIALS, CHEMICAL REACTIONS		6.1-4
	16	<i>PRESIDENT'S DAY -- NO CLASS</i>		
	18	ENTHALPY		6.5-7
	20	MAXWELL RELATIONS	3: CHAP 4-6	7.1-3
	23	APPLICATIONS OF MAXWELL RELATIONS		7.4-5
	25	STATISTICAL MECHANICS IN MICROCANONICAL FORMALISM: ENTROPY, SIMPLE MODELS		15.1-3
	27	POLYMER MODEL, HIGH DIMENSIONALITY		15.4-5
MAR	2	STABILITY OF SYSTEMS AND CONSTRAINTS ON THEIR THERMODYNAMIC PROPERTIES	4: CHAP 7,15	8
	4	FIRST-ORDER PHASE TRANSITIONS		9.1-3
	6	GIBBS PHASE RULE		9.4-6
	9	EXAM, CHAPTERS 4-7 AND 15 (BAND ROOM, 7-9 PM; REVIEW DURING CLASS)	EXAM 2	
	11	PHASE DIAGRAMS OF BINARY SYSTEMS (TEMP., PRESSURE, MOLE FRACTION)		9.7
	13	CRITICAL PHENOMENA; ORDER PARAMETERS		10.1-3
	16-20	<i>SPRING BREAK</i>		
	23	LANDAU THEORY, SCALING AND UNIVERSALITY; NERNST POSTULATE; SUMMING UP		10.4-6, 11, 12
	25	PROPERTIES OF MATERIALS: REACTIONS IN IDEAL GASES		13.1-2
	27	MORE ON REACTIONS, VIRIAL EQUATION OF STATE	5: CHAP 8-10	13.3
	30	LAW OF CORRESPONDING STATES, DILUTE SOLUTIONS		13.4-6
APR	1	CANONICAL FORMALISM: STATISTICAL MECHANICS IN HELMHOLTZ REPRESENTATION		16.1-4
	3	DENSITY OF STATES		16.5-7
	6	ELECTROMAGNETIC RADIATION; CLASSICAL IDEAL GAS	6:CHAP 11-13	16.8-11
	8	ENTROPY AND DISORDER: GRAND CANONICAL FORMULATION		17
	10	QUANTUM FLUIDS: FERMIONS, ELECTRONS IN A METAL		18.1-4
	13	EXAM, CHAPTERS 8-13 (BAND ROOM, 7-9 PM; REVIEW DURING CLASS)	EXAM 3	
	15	BOSONS		18.5-7
	17	FLUCTUATIONS	7:CHAP 16-17	19
	20	BOGOLIUBOV VARIATIONAL THEOREM; MEAN FIELD THEORY		20
	22	IRREVERSIBLE THERMODYNAMICS		14
	24	SYMMETRY AND FOUNDATIONS OF THERMOSTATISTICS	8:CHAP 18-19	21
	27	TO BE ANNOUNCED		
APR	29	TO BE ANNOUNCED		
MAY	1	WRAPUP		
MAY	6	FINAL EXAM (WEDNESDAY, MAY 6, 7-10 AM)	FINAL EXAM	

Text: Callen, Thermodynamics and an Introduction to Thermostatistics, (Wiley, 2nd ed., 1985)

Exams will be given in the evenings from 7-9 pm in the Band Room, with the class period that day used for review.

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