PHYS 5130 Principles of Thermal and Statistical Physics (2020-20 Term 1)
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BOOK LIST ON STATISTICAL PHYSICS & STATISTICAL MECHANICS

There are many books on statistical mechanics or statistical physics or statistical thermodynamics. The contents are quite standard. However, I could not find one that fits perfectly to our course. Here is a list standard textbooks and reference books. These books are available in the University Library. There are many "new" statistical physics textbooks published in recent years, as its relevance has been increasingly recognized even at the undergraduate level. Some of these books are also available in E-book form (free access via Library).

Standard Books:

D. Yoshioka, "Statistical Physics: An Introduction" (Springer 2007) [An excellent book written in a concise and precise way, with good insights. The book is short enough to be read in a few weeks. It covers everything that a student should know and who wants to become a research postgraduate student. Ebook format available via Library site.]

S.J. Blundell and K.M. Blundell, "Concepts in Thermal Physics" (Oxford Univ. Press 2006) [QC 254.2.B58 2006] [A thorough coverage on thermodynamics and statistical physics with interesting applications. Materials are presented in short chapters, each focusing on only a few major results. An excellent single book that covers all you need to know about thermodynamics and statistical mechanics at the senior undergraduate level and slightly beyond. It can be read online via Library site.]

C. Hermann, "Statistical Physics" (Springer 2005) [This book is easy to follow and has nice discussions on applications (solid state physics). It is available online via Library site.]

L. G. Benguigui, "Statistical Mechanics for Beginners", World Scientific 2010. [QC174.8 B46 2010] A very well written recent statistical mechanics textbook for first-time learners. It has a good standard coverage. A strong point is that the book is short (147 pages) and often the simplest/direct approach is used.

D. Chandler, "Introduction to Modern Statistical Mechanics", Oxford University Press. [QC174,8 C47] (This is a popular book in US universities at the beginning graduate level. The chapters are brief but the trade-off is that the book can cover more topics.

There are two chapters that give an excellent introduction to the theory of phase transitions and the applications of Monte Carlo simulations to study statistical physics models, e.g. magnetism.)

For those who want to read a book that has more than our coverage and goes further into your postgraduate studies, my suggestions are:

R.K. Pathria, "Statistical Mechanics" (2nd edition) (Oxford Univ. Press 1996). There is a 3rd edition with an additional author (Pathria and Beale). [This is a standard graduate level statistical mechanics book. After our course, I hope you could easily handle the first 8 chapters. The other chapters are related to interacting systems.]

Greiner, Neise, and Stocker, "Thermodynamics and Statistical Mechanics" (Springer). [One of the authors, Greiner, wrote a set of many textbooks covering all physics topics (from classical mechanics to field normalization and quantum chromodynamics). Following his style, the discussions are thorough and there are many worked examples (line by line with equations). The book covers both thermodynamics and statistical mechanics at a typical German physics curriculum.]

M. Kardar, "Statistical Physics of Particles" (Cambridge Univ. Press 2007) [Part I of a series of two books. We cover topics in Part I, but we use plain language. Part II is entitled "Statistical Physics of Fields".]

汪志诚 热力学. 统计物理 （第三版）高等教育出版社 (2002) [A standard and popular textbook in China on the subject intended for a standard coverage at the undergraduate level. Chapters 1-5 are on thermodynamics (good for self-revision if you think you need that) and Chapters 6-11 are on statistical physics. It remains a good book to get back to from time to time even for postgraduate students.]

Below are more books (some provide an easy path to understand statistical physics)

Tony Guenault, "Statistical physics" 2nd ed. Chapman & Hall. [QC174.8 .G84 1995] (A short book that uses probably the simplest approach in getting the key results in equilibrium statistical physics. Good for students who need to pick up the essentials of the subject for the first time and for those who want to get at the key results without bothering too much about formalism. There is a newer edition. As long as you know that many results are obtained by considering non-interacting particles, then it is fine.)

D.H. Trevana, "Statistical Mechanics: An introduction", Ellis Horwood [QC174.8.T63

1993] (Same approach as in Guenault and similar in coverage. A very practical book.)
W.G.V. Rosser, “An introduction to statistical physics”, Ellis Horwood. [QC174.8.R67] (Very detailed discussions on how to develop the theory from the basics. The starting point is similar to the book by Guenault, but the book takes the readers farther. Excellent discussion on the connections between statistical mechanics and thermodynamics, although quite wordy in places.)

Harald J. W. Muller-Kirsten, “Basics of Statistical Physics – A Bachelor Degree Introduction”, World Scientific 2010. Standard coverage. A strong point of the book is that there are many worked examples (derivations line-by-line). The author also wrote other textbooks on other physics subjects in the same style.

C. Kittel and H. Kroemer, “Thermal physics” 2nd ed. WH Freeman. [QC311.5 .K52 1980] (A standard textbook in US universities for undergraduates. It mingles thermodynamics and statistical mechanics.)

F. Reif, “Fundamental of Statistical and Thermal Physics”, McGrawHill. [QC175.R43] The style is similar to Kittel and Kroemer. A simpler version of the book is F. Reif, “Statistical Physics”, Berkeley Physics Course, Vol.5, McGrawHill. [QC21.4445 v.5] is aimed at beginners.

F. Mandl, “Statistical Physics”, 2nd ed. John Wiley & Sons. [QC174.8.M27 1988] (A standard textbook fits to the British university system under the Manchester series.)

D.J. Amit, “Statistical physics: An introductory course”, World Scientific. [QC174.8.A45 1999] (An excellent book for self-learning (no need to attend classes) written by an excellent author well known for his clarity. The coverage is standard. The author also wrote “Field Theory, the renormalization group, and critical phenomena” [QC173.4.C74A44 1984], from which many researchers learned how to apply field theoretical approaches to investigate critical phenomena.)

K. Huang, “Introduction to Statistical Physics”, Taylor & Francis. [QC174.8.H82 2001] (This is an interesting book by a master in statistical mechanics. Only 270 pages in length, the author gave a concise and precise introduction to the key ideas in statistical mechanics. But readers need to digest every sentence carefully. The discussions are quite deep. The lack of worked examples is a weak point. The author wrote a classic textbook “Statistical Mechanics” [QC175.8.H8 1987] back in 1963, which gives a rigorous treatment on the subject at the graduate level.)

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