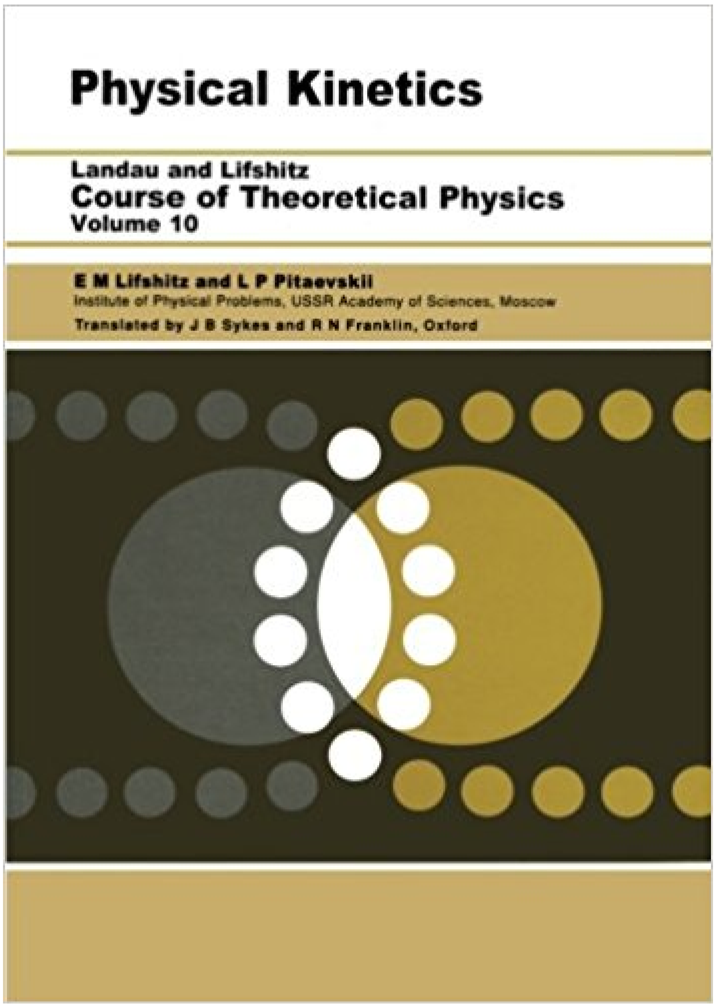
Physical Kinetics: Volume 10 (Course Of Theoretical Physics S)



Synopsis

This volume is mainly concerned with a systematic development of the theory of plasmas, the authority being firmly rooted in the pioneering work of Landau. Corresponding results are also given for partially ionized plasmas, relativistic plasmas, degenerate or non-ideal plasmas and solid state plasmas.

Book Information

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Customer Reviews

This is my 2nd favourite in the Landau Lifshitz Series, the first being mechanics. I haven’t read all the topics, but the ones I’ve read are covered beautifully. The discussion on the Boltzmann equation is extremely intuitive, every step follows logically and connects together. One thing you will notice, is that the equations are kept very short, maybe only a few terms. This is because the book relies heavily on physical intuition, instead of cranking math. This makes the development extremely intuitive, but the drawback is you have to do a lot of thinking, you can’t just grunt your math through it. I’ve always preferred Lifshitz’s treatment on Plasmas rather than typical plasma physics books. I’ve found his treatment is very physically motivated, some plasma physics books just throw equations at you and turn the math crank.One warning: because the coverage of topics is so wide and encyclopedic, it helps if you know what you want to learn specifically before diving in. I’d say if you are a graduate student in plasma physics/astrophysics, this is definitely a must have. I definitely would recommend this for all theoretical physics students, even high energy physics, but it seems nowadays, the trend in the US is to specialize early rather than having breadth of training.

This book is the volume 10 and the last volume of the great Course of Theoretical Physics by Landau and Lifshitz. It explains in great detail and rigour the theory of the processes ocurring in several systems not in statistical equilibrium. The book opens with a complete account of the transport processes in gases not in equilibrium, certainly the most representative physical system not in equilibrium. The Boltzmann transport equation is derived in a general and elegant way in this chapter. After a second chapter which developes a mathematical technique called the diffusion approximation, the book discusses various processes occurring in several systems not in equilibrium, notably the processes occurring in plasmas. Other systems, such as insulators, quantum liquids, metals etc are discussed. In a final chapter, it developes the kinetics of phase transitions, in a magnific and concise form. Really this is a superb book, where the reader will learn with detail all these subjects.

This is probably the best book written on the physical basis of (classical and quantum) kinetic phenomena. That said, the reader should be aware the book is written in the famous Landau style: derivations are carried out based on strong physical intuition and with minimum mathematical detailing and little rigour; much is expected from the reader. The rewards are high for those who (can) pursue the thing: you will be able to muse your collaborators by deriving all those nonlinear PDEs and at the same time to stand for or against recent experimental data by handwaving arguments (that depends a little bit on your brainware, too...). This book together with the Fluid Mechanics and the Electrodynamics of Continuous Media titles of the same series are almost everything you need to get a solid ground in the study of, e.g., plasma physics.

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