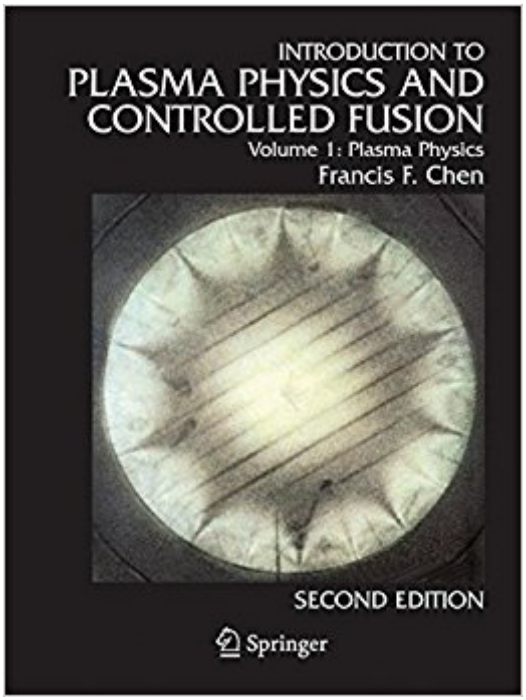
Introduction To Plasma Physics And Controlled Fusion. Volume 1, Plasma Physics



Synopsis

TO THE SECOND EDITION In the nine years since this book was first written, rapid progress has been made scientifically in nuclear fusion, space physics, and nonlinear plasma theory. At the same time, the energy shortage on the one hand and the exploration of Jupiter and Saturn on the other have increased the national awareness of the important applications of plasma physics to energy production and to the understanding of our space environment. In magnetic confinement fusion, this period has seen the attainment 13 of a Lawson number nTE of 2 x 10 cm -3 sec in the Alcator tokamaks at MIT; neutral-beam heating of the PL T tokamak at Princeton to KTi = 6. 5 keV; increase of average Ã to 3%-5% in tokamaks at Oak Ridge and General Atomic; and the stabilization of mirror-confined plasmas at Livermore, together with injection of ion current to near field-reversal conditions in the 2XIIÃ device. Invention of the tandem mirror has given magnetic confinement a new and exciting dimension. New ideas have emerged, such as the compact torus, surface-field devices, and the EÃ T mirror-torus hybrid, and some old ideas, such as the stellarator and the reversed-field pinch, have been revived. Radiofrequency heatÂ- ing has become a new star with its promise of dc current drive. Perhaps most importantly, great progress has been made in the understanding of the MHD behavior of toroidal plasmas: tearing modes, magnetic Vll Vlll islands, and disruptions.

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Customer Reviews

This complete introduction to plasma physics and controlled fusion by one of the pioneering

scientists in this expanding field offers both a simple and intuitive discussion of the basic concepts of this subject and an insight into the challenging problems of current research. In a wholly lucid manner the work covers single-particle motions, fluid equations for plasmas, wave motions, diffusion and resistivity, Landau damping, plasma instabilities and nonlinear problems. For students, this outstanding text offers a painless introduction to this important field; for teachers, a large collection of problems; and for researchers, a concise review of the fundamentals as well as original treatments of a number of topics never before explained so clearly. This revised edition contains new material on kinetic effects, including Bernstein waves and the plasma dispersion function, and on nonlinear wave equations and solitons.

Prof. Chen is a plasma physicist with a career extending over 48 years and encompassing both experiment and theory. He has devoted about a decade each to the subfields of magnetic fusion, laser fusion, plasma diagnostics, basic plasma physics, and low-temperature plasma physics. Most plasma students are familiar with his textbook Introduction to Plasma Physics and Controlled Fusion. His current interest is in plasma processing of semiconductor circuits, especially the radiofrequency sources used to make computer chips, and in the physical processes that permit etching millions of transistors on a single chip. To learn more about this, please visit the site for UCLA’s Low Temperature Plasma Technology Laboratory (LTPTL): http://www.ee.ucla.edu/~ltptl/. Though formally retired from teaching, Prof. Chen still maintains an active research group with graduate students and postdocs.

Having only gone through Chapter 4, I find that the general explanations and derivations to be easy to follow. However I don’t feel like the book is self contained, many times I have to consult other books to explain concepts that are not fully fleshed out in this book. Lastly, a minor nuisance is when the other uses certain terms that are quite ambiguous such as "schematic plot" which required to me speak to several people before I was convinced he just meant sketch.

However, you should take it with a grain of salt. This is a reprint of the 1980’s publication; while most of the information is still quite relevant, some of it is outdated, and quite often the absolute fundamental perspectives on things are ignored in favor of over-simplified assumptions (which was fine under the older school of plasma physics, but simply causes problems today where many plasmas are exceptions to the older school of thought, requiring a much more ’fundamentalist’ approach).

Through 2 chapters so far. A great source of knowledge.My one criticism is that the context is a bit mathematically heavy. Would have been nice to establish a more conceptualÃ¢Â Â‹ view at the begging.

A very accessible text on a somewhat esoteric, but important branch of physics. Concepts are explained clearly and mathematical derivations are easy to follow. Many exercise problems scattered throughout the text help keep you on top of the material. Solutions to selected problems in the back help you check yourself before you wreck yourself. If only a full solutions manual were available!

I took an intro to plasma physics class using this book at the undergraduate level - and this book was perfect. It has a good blend of experimental evidence, theory, and math. The derivations are really good, you can follow along in the margins. The pictures are clear and beautiful, the page layout easy on the eyes. This is not a graduate text, but aimed at the advanced undergrad level. You should already know calculus, complex analysis, EM, and linear algebra before learning this material.

This is one of the best introductory texts for plasma physics that I have found. As far as I know, volume 2 was never written but volume 1 does cover the important basics of plasma physics.

A must have text is studying plasm science.

good

Physics) Introduction to Plasma Physics: With Space, Laboratory and Astrophysical Applications Introduction to Plasma Physics High-Energy-Density Physics: Fundamentals, Inertial Fusion, and Experimental Astrophysics (Shock Wave and High Pressure Phenomena) Statistical Physics and Chaos in Fusion Plasmas (Nonequilibrium Problems in the Physical Sciences and Biology) Quantum Entanglement in Electron Optics: Generation, Characterization, and Applications (Springer Series on Atomic, Optical, and Plasma Physics) Numerical Simulation and Optimal Control in Plasma Physics: With Applications to Tokamaks (Modern Applied Mathematics Series) Auroral Plasma Physics (Space Sciences Series of ISSI) Fundamentals of Plasma Physics Encyclopedia of Controlled Drug Delivery, 2 Volume Set The Solid State: An Introduction to the Physics of Crystals for Students of Physics, Materials Science, and Engineering (Oxford Physics Series) Paracord Fusion Ties - Volume 1: Straps, Slip Knots, Falls, Bars, and Bundles