

New books on physics and related sciences

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Sadovskii M V *Diagrammatics: Lectures on Selected Problems in Condensed Matter Theory* (Moscow – Izhevsk: IKI, 2004) 336 pp. ISBN 5-93972-329-2.

This book contains the lectures designed to illustrate the use of diagram techniques in solving specific problems in the theory of condensed matter, the selection criterion for a problem being primarily its practical importance. Many of the problems are still waiting for a complete solution, thus offering the reader a range of self-study subjects. A detailed discussion of calculations and methodical approaches makes the book accessible to both the experienced researchers and novices in theoretical physics. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@ics.org.ru; URL: <http://www.ics.org.ru/>)

Sadovskii M V *Lectures on Quantum Field Theory* (Moscow – Izhevsk: RKhD, 2003) 480 pp. ISBN 5-93972-241-5.

This book provides a substantially extended synopsis of the lecture course given by the author in the Department of Physics at Ural State University. The chief aim of the course is to acquaint students of theoretical physics with a concise and elementary introduction to the fundamentals of modern quantum field theory and elementary particle physics. While the central themes of the course are the gauge theories of elementary particle interactions and basics of the Standard Model, the Feynman diagram technique and the formalism of functional (continuum) integration are also given a detailed exposition. The book is suitable for research workers as well as undergraduate and graduate students in physics, mathematics, and related disciplines. (Research and Publishing Center ‘Regular and Chaotic Dynamics’: 426034 Izhevsk, ul. Universitetskaya 1, UdSU; tel.: (7-3412) 50-02-95, (7-095) 332-48-92; e-mail: subscribe@rcd.ru; URL: <http://www.shop.rcd.ru/>)

Sadovskii M V *Lectures on Statistical Physics* (Moscow – Izhevsk: RKhD, 2003) 336 pp. ISBN 5-93972-240-7.

The material of this book is a somewhat extended synopsis of a course in “Statistical Physics”, built on well-known and fundamental textbooks and monographs. The book provides an elementary introduction to the methods of modern condensed matter theory as well as an examination of the basic principles of statistical physics and how they are applied to this theory. It will be a valuable introductory text for undergraduate and graduate students and faculty in physics. (Research and Publishing Center ‘Regular and Chaotic Dynamics’: 426034 Izhevsk, ul. Universitetskaya 1, UdSU;

tel.: (7-3412) 50-02-95, (7-095) 332-48-92; e-mail: subscribe@rcd.ru; URL: <http://www.shop.rcd.ru/>)

Kravchenko V F, Basarab M A *Boolean Algebra and Approximation Methods for Boundary Value Problems in Electrodynamics* (Moscow: Izdatel’stvo Fiziko-Matematicheskoi Literatury, 2004) 308 pp. ISBN 5-94052-079-0.

Combining as it does the ideas of Boolean algebra and analytical geometry, the theory of R -functions provides a universal tool with which the equations for the boundaries of regions of arbitrary geometry can be obtained in an implicit form. These equations allow building the structure of the solutions of the boundary value problems in complex-shaped regions — i.e., building analytical expressions which satisfy *a priori* the boundary conditions specified. The structure of the solution depends on undefined components which are found using either the Ritz functional minimization routine or a projection method. Solution algorithms and numerous example solutions are given for various types of outer and inner boundary value problems of electrostatics and electrodynamics in complex-shaped regions. It will serve as a useful reference source for research workers as well as graduate students and senior undergraduate students in related disciplines. (Physics and Mathematics Literature Publ.: 119071 Moscow, Leninskiĭ prospect 15; tel.: (7-095) 952-49-25; fax: (7-095) 955-03-30; e-mail: fizmatlit@mtu-net.ru; URL: <http://www.fizmatlit.narod.ru/>)

Gantmakher V F *Electrons in Disordered Media* (Moscow: Fizmatlit, 2003) 176 pp. ISBN 5-9221-0405-5.

The book is intended for senior undergraduate/graduate level students specializing in the field of solid state physics as well as for research workers and all those whose profession requires a basic understanding of the physical processes controlling the behavior of electrons in solids. Written with a minimum of mathematics, the book emphasizes the physical principles of and deep analogies and links between the phenomena discussed. (Fizmatlit Publ.: 117997 Moscow, Profsoyuznaya ul. 90; tel.: (7-095) 334-74-21; fax: (7-095) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Isotopes: Properties, Production, Application In two volumes (Ed. by V Yu Baranov) (Moscow: Fizmatlit, 2005) Vol 1: 600 pp. ISBN 5-9221-0522-1; Vol 2: 728 pp. ISBN 5-9221-0523-X.

This monograph is a collection of papers on a wide range of rapidly developing science and technology fields covering the production and application of stable and radioactive isotopes. Being the combination of widely different types of material, the book is designed as part handbook, part encyclopedia. The chapters of the book are written by leading experts directly engaged in isotope-dependent fields

of science and technology. The monograph focuses on the latest developments in these fields and is a useful reference source for scientists and practising engineers working with isotopes and seeking an introduction to neighboring areas of science and technology. On the other hand, understanding prospects for isotope production and application methods is necessary for specialists in a range of other fields where isotopes show promise of being used in the very near future. The book may serve as both a reference and a textbook for undergraduate and graduate students in nuclear physics, the physics and chemistry of isotopic effects, and isotope methods in biomedical research. (Fizmatlit Publ.: 117997 Moscow, Profsoyuznaya ul. 90; tel.: (7-095) 334-74-21; fax: (7-095) 334-76-20; e-mail: fizmat@maik.ru; URL: <http://www.fml.ru/>)

Yappa Yu A *An Introduction to Spinor Theory and Its Applications in Physics* A Textbook (Ed. by V A Franke) (St.-Petersburg: SPb State University Publ., 2004) 256 pp. ISBN 5-288-01951-7.

The spinor constitutes one of the most important geometric notions in the theoretical physics, which increasingly grows in significance in modern elementary particle theories. This manual aims to introduce the reader to the study of a number of basic concepts which, for all their current importance, have little or no textbook coverage. The material presented is based on fundamental ideas and in such a manner as to be accessible to students just beginning to study spinors. The manual covers both the classical application of this theory to three-dimensional rotations and Lorentz transformations in space-time and the properties of conformal groups and spaces of arbitrary finite dimensions. Special emphasis is placed on parallelism between the geometric and algebraic aspects of the spinor theory, which is especially important when the theory is applied to the development of the latest physical ideas (to some of which the reader is introduced here). The manual is intended for undergraduate and graduate students in the fields of quantum field theory and differential geometry, and it can also be useful to research workers in related fields. (SPb University Publ.: 199034 St.-Petersburg, Universitetskaya nab. 7/9; tel.: (7-812) 328-77-63; fax: (7-812) 328-44-22; e-mail: books@dk2478.spb.edu; URL: <http://www.unipress.ru/>)

Levinshtein M E, Simin G S *Getting Acquainted with Semiconductors* (Moscow – Izhevsk: IKI, 2004) 208 pp. ISBN 5-93972-310-1.

A fascinating account of the physics of semiconductors, this book traces the history of their discovery and study from the first experiments pursued by Hilbert and Cavendish to the present, describes numerous interesting effects that show themselves in semiconductors, and acquaints the reader with their device applications. It is intended for school and university students and faculty as well as for those engaged in self-tuition. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@ics.org.ru; URL: <http://www.ics.org.ru/>)

Il'ina V A, Silaev P K *Numerical Methods for Theoretical Physicists* Pt. 2 (Moscow – Izhevsk: IKI, 2004) 118 pp. ISBN 5-93972-320-9.

This manual was developed from lectures and practical sessions within a course in numerical methods for prospective theoretical physicists. The book's primary aim is to discuss a number of easy-to-understand and simple-enough-to-write algorithms which are mainly oriented towards the solution of typical problems in theoretical physics and which should undoubtedly be in the toolkit of any theoretical physicist. It will be particularly welcomed by undergraduate students in physics-related disciplines. (Institute for Computer Studies: 426034 Izhevsk, ul. Universitetskaya 1; tel./fax (7-3412) 50-02-95; e-mail: borisov@ics.org.ru; URL: <http://www.ics.org.ru/>)

Andrianov I V, Barantsev R G, Manevich L I *Asymptotic Mathematics and Synergetics: A Way to Holistic Simplicity* ('Synergetics: from the Past to the Future' Series) (Moscow: URSS, 2004) 304 pp. ISBN 5-354-00349-0.

Asymptotic methods serve as a tool with which to simplify the formulation and solution of mathematical modeling problems close to their singularities, the accuracy of the methods increasing as a singularity is approached. Forty years ago, in 1963, M Kruskal who pioneered the term 'asymptology' defined it as an art of dealing with applied mathematical systems in limiting cases. The transformation of this art into a science gave rise to asymptotic mathematics — a soft mathematics needed in biology, social science, and synergetics. What makes it akin to the last of these is the dynamism of their life-oriented methods which move from the limit to the approximation, from being to becoming, and from the completeness to the integrity. *Asymptotic Mathematics and Synergetics: A Way to Holistic Simplicity* presents a state-of-the-art account of the asymptotic analysis of mathematical models, written at a popular level suitable for a wide audience. The ideas, methods, and prospects of asymptotic mathematics are explored from both theoretical and applied perspectives. Along with traditional topics, currently popular research areas such as solitons, catastrophes, and chaos are covered. The creators of asymptotic methods are given credit in a separate chapter. The synergetic approach helps in understanding the essence of the simplicity which asymptology makes it possible to achieve. What makes asymptotics fundamentally valuable is that, rather than degenerating into sophisticated but lifeless schemes, it retains the integrated nature of a real object in any localized droplet. It was perhaps the asymptotic image of the world that the Japanese poet had in mind when saying "All in one, and one in all." The simplicity of asymptotics is one of holism. The book is aimed at all those who have already realized the inevitable asymptotic nature of a human and seek better knowledge and mastery of the asymptotic mathematics approaching us. (Editorial URSS Publ.: 117312 Moscow, Prosp. 60-letiya Oktyabrya 9, office 203 at the RAS Institute for Systems Analysis; tel./fax (7-095) 135-44-23, 135-42-46; e-mail: urss@urss.ru; URL: <http://www.urss.ru/>)

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