

New books on physics and related sciences

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Nikiforov A F, Novikov V G, Uvarov V B *Quantum Statistical Models of High Temperature Plasma and Methods for Calculating Rosseland Mean Free Paths and Equations of State* (Moscow: Fizmatlit, 2000) 400 pp. Bibliography: 223 refs. ISBN 5-9221-0052-1.

This book addresses the opacity of plasma, i.e., methods for calculating the spectral absorption coefficients and Rosseland mean free paths for high-temperature plasmas. Opacity is a fundamental physical problem because an adequate description of the radiation-matter interaction is crucial in astrophysics and the physics of high-energy explosions, in understanding how laser, electron, and ion beams affect materials, and in modeling high energy-concentration devices — in particular powerful X-ray sources. Understanding high-temperature plasma processes requires a knowledge of the thermodynamic and radiation properties of plasma — i.e., its equation of state, the absorption coefficients and emissivity as functions of its state, and the characteristics of the radiation interacting with it. The book discusses the popular quantum statistical models of high-temperature plasma — Thomas–Fermi, Hartree–Fock, and Hartree–Fock–Slater models — extended to arbitrary temperatures and densities within the average atom approximation. It is shown how these methods, in combination with modern computers, provide a calculation of the spectral absorption coefficients of photons, Rosseland mean free paths, and equations of states necessary for simulating radiative hydrodynamical processes in high-temperature plasma. Most of the book’s material is based on the lectures given by Professor A F Nikiforov to students at the MSU Physics Department for many years. Accordingly, the book will be useful to students in various areas of physics who seek a better knowledge of some aspects of quantum mechanics, statistical physics, and computational mathematics. It will also be an important resource for specialists in the physics of high temperature plasma. (Fizmatlit Publ.: 117864 Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-7421, 334-7620; e-mail: Fizmat@maik.ru)

Trubetskov D I, Rozhnev A G *Linear Vibrations and Waves* Textbook (“Modern theory of vibrations and waves” series) (Moscow: Izd. Fiziko-Matematicheskoi Literatury, 2001) 416 pp. ISBN 5-94052-028-6.

This textbook provides a systematic introduction to the linear theory of vibrations and waves. Beginning with the simple linear oscillator, theoretical models of increasing complexity

are considered, including the oscillator under external influences, coupled oscillators, a medium of oscillators, wave kinematics, instabilities, and waves in nonhomogeneous media. The material is illustrated by examples from physics, chemistry, biology, and economics. The mathematical apparatus of the linear theory of vibrations and waves is presented. Recommended by the Russian Federation Ministry of Education as a text for undergraduate students in various areas in physics. Intended for undergraduates and postgraduates in physics and engineering and for research scientists with an interest in vibration and wave processes. (Physics and Mathematics Publishing address: 117071 Moscow, Leninskii prosp., 15; tel.: (7-095) 952-4925, 955-0330; fax: (095)955-0314; e-mail: fizmatlit@narod.ru; website: fizmatlit.narod.ru/)

Kusnetsov A P, Rozhnev A G, Trubetskov D I *Linear Vibrations and Waves* Problem Book. Textbook (“Modern theory of vibrations and waves” series) (Moscow: Izd. Fiziko-Matematicheskoi Literatury, 2001) 128 pp. ISBN 5-94052-023-5.

This collection contains over 200 problems covering the fundamentals and mathematical apparatus of the linear theory of vibrations and waves and illustrating vibrational and wave processes in various areas of physics. Considerable attention is given to such important aspects of the theory as coupled vibrations and waves, wave instabilities, and waves in liquids and dispersive media. The problems were tested at seminars in the theory of vibrations and waves at Saratov State University’s Physics Department and Nonlinear Processes Department. Recommended by the Russian Federation Ministry of Education as a text for undergraduates in various areas in physics. Intended for undergraduate and postgraduate students in physics and engineering as well as for research scientists with an interest in the theory of vibrations and waves. (Physics and Mathematics Publishing address: 117071 Moscow, Leninskii prosp., 15; tel.: (7-095) 952-4925, 955-0330; fax: (7-095) 955-0314; e-mail: fizmatlit@narod.ru; website: fizmatlit.narod.ru/)

Galitskiĭ V M, Karnakov B M, Kogan V I *Problems in Quantum Mechanics* 3rd ed. Revised and Enlarged Part 1, 2 (Moscow: Éditorial URSS, 2001) Part 1, 304 pp. ISBN 5-354-00002-5. Part 2, 304 pp. ISBN 5-354-00003-3.

The book contains problems of varying levels of difficulty on primarily non-relativistic quantum mechanics. The first part covers the basic principles, mathematical apparatus, and computational methods of non-relativistic quantum mechanics and illustrates their application by simple model systems. Solutions to all problems are provided. The problems in the second part illustrate the application of quantum mechanics

to atomic physics, the nucleus, and particle physics — inasmuch as special methods and approaches are not needed. Many problems illustrating scattering theory, radiation theory, and relativistic wave equations are included. Again, solutions to all problems are provided. Intended for undergraduate and postgraduate quantum mechanics courses for experimenters and theorists alike. (Editorial URSS Publ.: 117312 Moscow, prosp. 60-letiya Oktyabrya 9, office 203, RAS Institute for System Analysis; tel./fax (7-095) 135-4423, 135-4246, urss@urss.ru; website: <http://urss.ru/>)

Ivanov-Shits A K, Murin I V *Solid State Ionics* in 2 volumes Vol. 1 (St Petersburg: SPb State University Publ., 2000) 616 pp. Bibliography: 3707 refs. ISBN 5-288-02745-5.

This book addresses the most topical problems in solid state ionics, a new scientific discipline lying at the intersection of solid state physics, solid state chemistry, crystallography, and material science. Much attention is given to the physical and chemical fundamentals of superionic conductors (solid electrolytes) and to anomalously fast ion-transfer processes in solids. The book presents detailed information on the crystal structure, phase transitions, and ion and electron transfer for the main classes of the current cation conductors. The book is intended for research scientists and undergraduate and postgraduate students specializing in solid state physics, solid state chemistry, and materials science. (SPb University Publ.: 199034 St Petersburg, Universitetskaya nab. 7/9; tel.: (7-812) 328-7763; fax: (7-812) 328-4422; e-mail: books@dk2478.spb.edu; website: <http://uni-press.spb.ru/>)

Akhiezer N I *Selected Works on the Theory of Functions and Mathematical Physics* Volumes I, II (Khar'kov: Akta, 2001) Vol. I, 352 pp. ISBN 966-7021-21-1. Vol. II, 520 pp. ISBN 966-7021-63-7.

In the first volume, the eminent mathematician's papers on the theory of polynomials least deviating from zero are included which further develop the work of P L Chebyshev, E I Zolotarev, and A A Markov. The author finds the general form of such a polynomial for the case when its three leading coefficients are prescribed. The second volume is concerned with the theory of approximations in mathematical physics, including the use of polynomials or exponential-type entire functions for approximating functions continuous over the entire axis. Of special note are several papers on the theory of orthogonal polynomials on a system of intervals. The continual analogues of such polynomials are also considered. These works opened a whole new line of research in the theory of entirely integrable nonlinear equations. (Akta Science Publ.: 61145 Ukraine, Khar'kov, ul. Novgorodskaya 1; e-mail: we@acta.com.ua; website: <http://www.acta.com.ua/>)

Yakovlev G N *Lectures on Mathematical Analysis* Textbook Parts 1, 2 ("Lectures at the MFTI Higher Mathematics Department" Series) (Moscow: Izd. Fiziko-Matematicheskoi Literatury, 2001) Part 1, 400 pp. ISBN 5-94052-024-3. Part 2, 480 pp. ISBN 5-94052-038-3.

This textbook is based on the lectures given by the author to first year students at the Moscow Physics and Technology

Institute. The publication of the textbook was made possible through the support of the Federal Special-Purpose 'Integration' Program. Recommended by the Teaching Methodology Board of the Moscow Physics and Technology Institute (State University) as a text for undergraduate courses in Applied Mathematics and Physics. The text is intended for colleges with an extended program in mathematics and can also be used as a self-study manual on some aspects of analysis. (Physics and Mathematics Publishing address: 117071 Moscow, Leninskii prosp., 15; tel.: (7-095) 952-4925, 955-0330; fax: (7-095) 955-0314; e-mail: fizmatlit@narod.ru; website: fizmatlit.narod.ru/)

Complex Analysis in Modern Mathematics. A Collection for Boris Vladimirovich Shabat's 80th Birthday (Compiled and Edited by E M Chirka) (Moscow: FAZIS, 2001) 304 pp. ISBN 5-7036-0066-9.

Devoted to a remarkable mathematician, teacher, and educator, this book opens with a short memorial part which conjures the image of a man whom nobody who knew him can forget. The scientific part of the book — a collection of the original papers by B V Shabat's colleagues and students — presents an overview of the state of art in complex analysis and shows its relationships to its closest mathematical environment — relationships which form an impressive multifaceted picture of the modern theory of functions of many complex variables. Topical and as yet unsolved problems of complex analysis in many dimensions are indicated. (FAZIS Publ.: 123557 Moscow, Presnenskiĭ val, 42-44; tel./fax: (7-095) 253-0820; e-mail: phasis@aha.ru; website: <http://www.aha.ru/~phasis/>)

Friedman A A *The World as Space and Time* (Izhevsk: RKhD, 2001) 96 pp. ISBN 5-93972-064-1.

Written by the eminent Russian scientist Aleksandr Aleksandrovich Friedman, this book was the first popular science exposition of the theory of relativity to appear in Russian. In spite of the many popular and academic publications on Einstein's theory since the book's appearance 80 years ago, it has lost nothing of its value. Anyone interested in new physics and its history will enjoy this book and benefit from it. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk, ul. Universitetskaya, 1; tel.: (7-3412) 78-39-33; website: <http://old.rcd.ru>)

Malanin V V, Poloskov I E *Random Processes in Nonlinear Dynamical Systems* (Izhevsk: RKhD, 2001) 160 pp. ISBN 5-93972-078-1.

This book addresses the applied theory of Markov random processes and describes a large number of statistical dynamics methods for solving stochastic differential equations, Fokker–Planck–Kolmogorov equations, and Pugachev's integro-differential equations. The book is intended for undergraduate and postgraduate students and research scientists concerned with random phenomena in nonlinear dynamics systems. It can also be used as a text for undergraduate courses in related areas and will serve as a reference on statistical dynamics methods. The publication has received financial support from Perm' State University. ('Regular and Chaotic Dynamics' Publ.: 426034 Izhevsk,

ul. Universitetskaya, 1; tel.: (7-3412) 78-39-33; website: <http://old.rcd.ru>)

Abramov I I, Novik E G *Numerical Modeling of Metallic One-Electron Transistors* (Minsk: Bestprint Publ., 2000) 164 pp. Bibliography: 122 refs. ISBN 985-6227-92-5.

This book presents a classification scheme for one-electron nanoelectronics structures. A methodology for assessing the limiting characteristics of one-electron transistors is described. A 2D numerical model involving the Poisson equation is developed for metallic one-electron transistors. Both known models and methodologies and those proposed by the authors are used as a basis for a complex of one-electron structure modeling programs, called SET-NANODEV, designed for the study of one-electron devices and structures. Using the complex, a range of metallic one-electron transistors based on metal–metal compounds (Al/AIO_x, Al/SiO₂, Au/Al₂O₃, Nb/Al₂O₃, Ti/TiO_x, Cr/Cr₂O₃, Nb/NbO_x) are investigated. The monograph is intended for specialists in the fields of microelectronics and nanoelectronics and should also be useful to teachers and senior undergraduates and postgraduates in related areas. (Bestprint Publ.: Belarus', 220007 Minsk, ul. Fabritsiusa 5)

Kononovich É V, Moroz V I *General Astronomy* (Moscow: Éditorial URSS, 2001) 544 pp. ISBN 5-354-00004-1.

Written for undergraduate courses in general astronomy, this book places emphasis on the development of major astronomical concepts and the latest advances in this science and provides insights into various branches and methods of modern astronomy, all united in the all-embracing inquiry into the nature of the Universe. For students in astronomy at universities and pedagogical colleges. Teachers in secondary schools and pedagogical colleges should also be interested. (Éditorial URSS Publ.: tel./fax (7-095) 135-4423, tel. (7-095) 135-4246, urss@urss.ru; website: <http://urss.ru/>).

Compiled by *E V Zakharova* (E-mail: zaharova@ufn.ru)