New books on physics and related sciences

Trubetskov D I, Khramov A E *Lectures on Microwave Electronics for Physicists* Vol. 1 (Moscow: Fizmatlit, 2003) 496 pp. ISBN 5-9221-0372-5.

Rather than focusing on the technical aspects of modern microwave electronics and briefly describing the physical foundations and rudiments of the theory of electron tubes of various kinds, this book presents a detailed description of the basic physical phenomena which are related to the interaction of electron fluxes with electromagnetic fields and are the basis for various types of devices. Much attention is given to the computer simulation of electron flow phenomena at ultra-high frequencies. The exposition is designed to show the close relationship of microwave electronics with the theory of radiation and with modern nonlinear theory of waves and vibrations. A distinguishing feature of the book is that the history of microwave electronics received some coverage. The first volume of the book presents the basic concepts, methods, and models of 'classical' microwave electronics and also considers the relativistic analogues of classical microwave devices (klystrons, travelling-wave and backward-wave tubes, crossed-fields devices). The lectures are intended for physicists in various disciplines, interested in electron interactions with electromagnetic fields, and for scientific workers, postgraduate students, and engineers making studies in the fields of vacuum microwave electronics, radiophysics, radio engineering, and plasma physics. Senior undergraduate students in related disciplines may also benefit from these lectures. (Fiziko-Matematicheskaya Literatura & MAIK Nauka/Interperiodika Publishing: 117997 Moscow, Prof-soyuznaya ul. 90; tel./fax (7-095) 334-74-21, 334-76-20; e-mail: fizmat@maik.ru; URL: http://www.fizmatlit.ru)

Aldoshkin Yu G *Mechanics of Solid Bodies*: *An Introduction* (Moscow: Mir, 2003) 304 pp. ISBN 5-03-003554-0.

This book provides a nonclassical introduction to the mechanics of solid bodies. The theoretical material it presents is based on the systematic use of a special group of space coordinate transformations. The basic concepts of the mechanics of solid bodies are defined as linear geometrical objects associated with this transformation group. Much attention is given to how the coordinates of mechanical objects transform under a change in a coordinate system, and to the general method by which the equations of motion of a solid body (or a system of bodies) can be written in a compact form in an arbitrary coordinate system. The method advanced lends itself to algorithmization based on matrix calculations and can be used both in analytical studies and in numerical simulation of engineering problems. The exposition is illustrated by examples and exercises. It is intended for senior students in physics at the universities and technical colleges, research engineers in the mechanics of the systems of many bodies (mechanics of machines, robotic engineering, manipulators, space vehicle dynamics, gyroscopic systems, anthropomorphic mechanisms, etc.), as well as for practising engineers in mechanics. (Mir Publ.: 107996, GSP-6, Moscow, 1st Rizhskiĭ per. 2; tel.: (7-095) 286-83-88; URL: http://www.mir-pubs.dol.ru/)

Kravchenko A F *Magnetic Electronics* (Novosibirsk: Izd. SO RAN, 2002) 400 pp. ISBN 5-7692-0485-0.

This textbook on magnetic electronics examines the foundations of the physics of magnetism, describes the magnetic properties of electrons, atoms, and solids, and discusses various functional devices for information processing, which are based on magnetic interactions. The advantages and disadvantages of such devices are described, their range of application and achieved performance parameters are discussed, and prospects for the future development of modern electronics are assessed. The textbook is designed for senior undergraduate and postgraduate university students specializing in the fields of informatica, solid state physics, and solid state electronics, and also for in-service teacher training courses. (SB RAS Publ.: 630090 P.B. 187, Novosibirsk, Morskoĭ prosp. 2; tel./fax: (7-3832) 30-17-58; fax: (7-3832) 33-37-55; e-mail: sprice@ad-sbras.nsc.ru; URL: http://www-psb.ad-sbras. nsc.ru/)

Tertychnyĭ-Dauri V Yu *Adaptive Mechanics* (Moscow: Factorial, 2003) 464 pp. ISBN 5-88688-064-X.

This book is a revised and enlarged version of the original 1998 edition. In it, various problems of the adaptive control of nonlinear mechanical systems are considered, methods for their solutions are discussed, and the results of investigations are presented. A theory of the adaptive synthesis of holonomic and nonholonomic Lagrange systems with unknown constant and time-drifting parameters is developed. The major emphasis is on creating optimal and suboptimal stabilizing adaptive control systems (strategies) in feedback form, for which the higher derivatives of the controlled object's state need not be measured. A detailed derivation and qualitative description of stable noise-resistant adaptive control algorithms are given, enabling the regulators with tuned parameters to operate for the purpose that the system can execute prescribed motions. Theoretical analysis is accompanied by informative model examples. The book is for specialists in control theory and cybermechanics, practising engineers and technologists, and

undergraduate and postgraduate students. (Faktorial Publ., e-mail: factorial@mail.compnet.ru)

Fistul' V I *Laws of Atomic and Quantum Physics* (Moscow: Izd. Fiziko-Matematicheskoĭ Literatury, 2003) 176 pp. ISBN 5-94052-069-3.

The basic laws of nonclassical physics are presented in an accessible form. An account is given of how the fundamental laws of atomic and quantum physics were discovered, what key experiments preceded their discovery, what quantum theory is, and how various atomic models and atomic nucleus models differ. The relationship between the theory of relativity and quantum mechanics is demonstrated. This book is designed for school and undergraduate university students, for teachers, and for a wide range of science and engineering intelligentsia. (Physics and Mathematics Literature Publ.: 119071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095) 955-03-14; e-mail: fizmatlit@narod.ru; URL: http://www.fizmatlit.narod.ru/)

Krylov N S *Works on the Justification of Statistical Physics* 2nd ed. (Moscow: Editorial URSS, 2003) 200 pp.

This book by Nikolaĭ Sergeevich Krylov (1917–1947), a talented scientist who died early in life, focuses on the questions of the justification of statistical physics. It includes the opening chapters of his intended large monograph *Justification of Physical Statistics*; his doctoral dissertation whose material replaces in part the monograph's missing chapters, and a small paper "On the description of non-maximally complete experiments". It is intended both for specialists — theoretical physicists — as well as for senior undergraduate and postgraduate students. (Editorial URSS Publ.: 117312 Moscow, Prosp. 60-letiya Oktyabrya 9, office 203 in 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/)

Samarskiĭ A A, Vabishchevich P N *Numerical Methods for Solving Convection–Diffusion Problems* (Moscow: Editorial URSS, 2003) 248 pp. ISBN 5-354-00150-1.

This book addresses the basic questions of approximately solving convection–diffusion problems by numerical methods. Discrete models are obtained based on finite-difference and finite-element approximations. Monotonic difference schemes for problems with divergent and nondivergent convective transfer are developed. For the approximate solution of nonself-conjugate elliptic network problems, iteration methods are used. Based on the general theory of stability (correctness) of operator-difference schemes, non-stationary convection–diffusion problems are studied. The possibility of employing space-split additive difference schemes is discussed. The book is intended for specialists in the computational methods of mathematical physics and in mathematical simulation in the mechanics of continua. The material is easily understandable to senior undergraduate students at technical universities. (Editorial URSS Publ.: 117312 Moscow, Prosp. 60-letiya Oktyabrya 9, office 203 in 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/)

Shubin M A *Lectures on Equations of Mathematical Physics* (Moscow: Izd. MTsNMO, 2003) 303 pp. ISBN 5-900916-97-9.

This book presents — with little or no alteration — the content of an annual lecture course on the equations of mathematical physics the author delivered at the experimental stream at the Physics and Mathematics Department of Moscow State University. Compared to existing courses in mathematics, emphasis is placed here on links and interaction with geometry and physics and the physical interpretation of results. The book contains elements of the theory of basic equations of mathematical physics, which are presented based on functional analysis and the theory of generalized functions. In particular, the book features a nontraditional exposition of the simplest aspects of the theory of potential and also discusses short-wavelength asymptotic forms of the solutions to hyperbolic equations, thus linking wave and geometrical optics. Problems at the end of each section help to reinforce the lesson and complement the main content of the book. This publication is for undergraduate and post-graduate students and scientific workers — mathematicians and physicists alike. (Publishing House of Moscow Continuous Mathematical Education Center: 121002 Moscow, Bol'shoĭ Vlas'evskiĭ per. 11; tel.: (7-095) 241-72-85; fax: (7-095) 291-65-01; e-mail: biblio@mccme.ru; URL: http://www.mccme.ru/)

Petrovskiĭ I G *Lectures on the Theory of Integral Equations* 2nd ed. (Moscow: Editorial URSS, 2003) 120 pp. ISBN 5-354-00184-6.

The classical work of Academician I V Petrovskiĭ (1901–1973) is based on the prominent mathematician's 1946 lecture course at M V Lomonosov Moscow State University. The book examines linear integral equations, formulates definitions, gives examples and typical problems which require the solution of such equations, presents a detailed theory of Fredholm integral equations, and describes Volterra equations and integral equations with real symmetric kernels. It is recommended for future mathematicians and physicists — undergraduate university students, as well as postgraduates and specialists extending their interests into mathematics. (Editorial URSS Publ.: 117312 Moscow, Prosp. 60-letiya Oktyabrya 9, office 203 in 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/)

Efimov A V, Pospelov A S, Demidovich B P *A Book of Problems in Mathematics for Technical Universities* Manual for technical universities. In four parts. Part 4. 3rd edition revised and enlarged (Moscow: Izd. Fiziko-Matematicheskoĭ Literatury, 2003) 432 pp. ISBN 5-94052-037-5.

This book contains problems on special courses in mathematics: the theory of probability and mathematical statistics. In all sections, the necessary theoretical material is presented. All problems are provided with answers, and the most complex of them with solutions. For some of the problems, computer solution is envisaged. It is intended for students at higher education engineering institutions. (Physics and Mathematics Literature Publ.: 119071 Moscow, Leninskiĭ prosp. 15; tel.: (7-095) 952-49-25, 955-03-30; fax: (7-095)

955-03-14; e-mail: fizmatlit@ narod.ru; URL: http://
www.fizmatlit.narod.ru/)

Kudryavtsev L D, Kutasov A D, Chekhlov V I, Shabunin M I
A Book of Problems in Mathematical Analysis In three
volumes. Vol. 1 *Limit. Continuity. Differentiability* Vol. 2
Integrals. Series Vol. 3 *Functions of Several Variables*
(Moscow: Fizmatlit, 2003) Vol. 1: 496 pp. ISBN 5-9221-
0306-7; Vol. 2: 504 pp. ISBN 5-9221-0307-5; Vol. 3: 472 pp.
ISBN 5-9221-0308-3.

This problem book draws upon many years of experience in
teaching a course on mathematical analysis at Moscow
Physical Technical Institute. The first volume includes
material related to the concepts of limit, continuity, and
derivative. The second volume contains material related to
the following areas of mathematical analysis: indefinite
integrals, definite integrals, improper integrals, numerical
series, and functional sequences and series. The third volume
includes material on the following branches of the course of
mathematical analysis: differential calculus of functions of
several variables; multiple, curvilinear, and surface integrals;
vector analysis; parameter-dependent integrals, and elements
of functional analysis. Each section of the book contains
reference material, a set of typical examples with solutions,
and problems with answers for personal study. It is intended
for students at universities and technical colleges with
extended syllabus in mathematics. (Fizmatlit Publ.: 117864
Moscow, ul. Profsoyuznaya 90; tel./fax: (7-095) 334-74-21,
334-76-20; e-mail: fmlsale@maik.ru; URL: http://www.
fizmatlit.ru/)

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