

New books on physics and related sciences: December 2023

DOI: <https://doi.org/10.3367/UFNe.2023.11.039594>

Sadovnichiy V A *Operator Theory*. Textbook (Classical University Textbook) 7th edition, rev. (Moscow: Moscow University Publishing House, 2023) 380 pp. ISBN 978-5-19-011828-5.

The textbook corresponds to the program of courses Functional Analysis, Operator Theory and Analysis III delivered in universities and pedagogical institutes. It presents basic diversified theoretical concepts; the general theory of metric, topological, linear topological, and normalized spaces; and the general theory of measure, measurable functions, and the Lebesgue integral. The operator theory in Hilbert space, the spectral theory of self-conjugated operators, traces of operators, applications of the methods of analytical functions theory in the spectral theory of non-self-conjugated operators, Fourier transform theory, and generalized functions are considered in detail. The book is intended for students at universities, pedagogical institutes, and institutes with in-depth studies of mathematics. It may be useful to postgraduates and researchers. The book is published in accordance with the publishing program dedicated to the 270th anniversary of Moscow State University. It is recommended by the Ministry of Education of the Russian Federation as a textbook for students of higher educational institutions studying in areas and specialties of physics and mathematics. (Moscow University Publishing House: e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

Petrov S V *Introduction to the Special Theory of Relativity*. Tutorial. (Moscow: Moscow University Publishing House, 2022) 164 pp. ISBN 978-5-19-011696-0.

The manual outlines the main ideas of the Special Theory of Relativity. It is shown how their sequential use allows formulation of relativistic dynamics, the electromagnetic field theory, and relativistic quantum mechanics. The book will therefore be useful in studying the corresponding sections of theoretical physics. It is intended for students and postgraduates of physical specialties at universities and for all those interested in the theory of relativity. (Moscow University Publishing House: e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

Syshchenko V V *Quantum Electrodynamics for Beginners*. 3rd edition, rev. and suppl. (Series: University Textbooks and Tutorials) (Moscow–Izhevsk: Institute of Computer Science, 2021) 254 pp. ISBN 978-5-4344-0919-3.

The manual is intended for initial acquaintance with the subject. It presents in an accessible form the basic ideas and the computational techniques of quantum electrodynamics. Some examples are considered in detail. The reader is first required to be familiar only with the basics of nonrelativistic quantum mechanics and the Special Theory of Relativity. The book is intended for institute teachers and senior students of physical specialties. (Publishing House of Technical Literature, Institute of Computer Science: e-mail: mail@rcd.ru, URL: <https://shop.rcd.ru/>)

Murtazaev A K, Babaev A B *Computational Physics and Problems with Phase Transitions*. (Moscow: Fizmatlit, 2023) 240 pp. ISBN 978-5-9221-1970-2.

The monograph presents the main ideas, computational methods, and results of numerical studies of phase transitions and critical phenomena in pure and disordered spin systems. The monograph is based on the series of scientific studies carried out by the authors over the past twenty years. The main focus is on the study of the influence of frozen-in disorder realized as non-magnetic impurities on phase transitions and critical phenomena in spin systems, described by Ising and Potts lattice models at various lattices using Monte Carlo numerical methods. The monograph is of interest for research workers, university teachers, postgraduates, and students involved in problems of condensed matter physics in the field of phase transitions and critical phenomena, as well as for all those using computational physics (Monte Carlo and molecular dynamics methods) in their research. Reviewers: director of the L F Vereshchagin Institute of High Pressure Physics RAS, doctor of physics and mathematics, academician of RAS, Vadim Veniaminovich Brazhkin and head of the Department of Theoretical Physics of F M Dostoevsky Omsk State University, doctor of physics and mathematics, Professor Vladimir Vasil'evich Prudnikov. Some of the research results presented in the monograph were obtained with the support of the Russian Foundation for Basic Research, grants 13-02-00220 and 19-02-00153. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Chernyaev A P, Lykova E N, Borshchegovska P Yu *Medical Radiation Physics*. Textbook (Classical University Textbook, gen. ed. Prof. A P Chernyaev) (Moscow University Publishing House, 2023) 559 pp. ISBN 978-5-19-011843-8.

The textbook is based on the special courses delivered at the Department of Accelerator Physics and Radiation Medicine of the Physics Faculty of MSU for twenty years. The main material for the book rests on the manuals of the series Library of the Medical Physicist from the basic courses of the department published in 2017–2019. The textbook has

three sections: theoretical chapters, nuclear physics in medicine, and clinical dosimetry and quality assurance. The textbook is intended for students of physical, physico-technical, chemical, and radiobiological specialties in the fields of the physics of the atomic nucleus and elementary particles and medical physics. It will also be useful for students of other physical, chemical, biological, and medical specialties preparing for work in radiological departments of oncological institutions. The book is also aimed at students studying in the program of additional professional retraining of medical physicists, as well as physicians working in roentgenology, radiation therapy, diagnostics, and nuclear medicine. It is recommended for students of physical, physico-technical, chemical, and radiobiological specialties. It is issued according to the publishing program devoted to the 270th anniversary of Moscow State University. (MSU Publishing House (Publishing House of Moscow University): e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

Nikabadze M U *Development of the Method of Orthogonal Polynomials in the Mechanics of Micropolar and Classical Elastic Thin Bodies*. (Classical University Textbook) (Moscow: Publishing House of Moscow University, 2023) 665 pp. ISBN 978-5-19-011849-0.

The book is devoted to the construction of different versions of the theories of elastic thin bodies using orthogonal polynomial methods. Considered are selected questions of classical and micropolar mechanics of continuous media and eigenvalue problems for tensor objects of any even rank with some applications in mechanics. Formulas explicitly expressing complete systems of orthonormalized proper tensor objects are derived. Materials are classified. The book is intended for researchers, students, and postgraduates majoring in the mechanics of deformable solids and the mechanics of fine constructions. It is published in accordance with the publishing program devoted to the 270th anniversary of Moscow State University. (MSU Publishing House (Publishing House of Moscow University): e-mail: zakaz@msupress.com, URL: <https://msupress.com/>)

Kotlyar V V, Stafeev S S, Kovalev A A *Optical Hall Effect in a Sharp Focus*. (Moscow: Fizmatlit, 2023) 240 pp. ISBN 978-5-9221-1975-7.

The monograph is devoted to the recently discovered effect in a laser light focus—the optical Hall effect based on the phenomenon of transverse displacement (in different directions) in a magnetic field of different-sign or different-spin charges carrying electric current. In optics, particles with different spins correspond to light beams with left-hand and right-hand circular polarization, and therefore the optical Hall effect in the focus consists in the formation of spatially separated regions, in which light has different directions of elliptical or circular polarization. Using the example of specific light fields having an inhomogeneous linear polarization before focusing, the authors showed that in a sharp focus these light fields form subwave regions with left-hand and right-hand elliptical polarization, which is a manifestation of the spin Hall effect. The book may be of interest to a wide range of researchers and engineers in the field of optics, photonics, laser physics, optoinformation technologies, and optical instrumentation, and also to students in bachelor's and master's programs in the specialties Applied Mathe-

tics and Physics, Applied Mathematics and Informatics, and Optics, and postgraduates in the indicated fields of science. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Kotlyar V V, Kovalev A A, Abramochkin E G *Superpositions of Vortex Laser Beams*. (Moscow: Fizmatlit, 2023) 200 pp. ISBN 978-5-9221-1976-4.

The monograph presents interesting results obtained by the authors in the last two years concerning the superposition of optical vortices. In ordinary Laguerre–Gaussian or Bessel–Gaussian vortex beams, the topological charge is equal to an integer number of an angular harmonic, which is present as a factor in the complex amplitude describing given beams. The question arises as to what the topological charge of a coaxial superposition of at least two such beams is equal to. The book shows that the topological charge of the superposition of two Bessel–Gaussian beams is equal to the topological charge of the beam with a larger wave-vector transverse projection. The topological charge of the superposition of two Laguerre–Gaussian beams with different waist radii is equal to the topological charge of the beam with the larger waist radius. The topological charge of the axial superposition of Laguerre–Gaussian beams with equal waist radii is equal to the modulus of the maximal topological charge in the superposition. The topological charge of the superposition of two parallel Laguerre–Gaussian beams is equal to the arithmetic mean of the topological charges of these beams plus/minus (if they are different-parity charges). The book also describes new laser vortex beams, whose complex amplitudes satisfy the paraxial Helmholtz equation. They include double Laguerre–Gaussian beams, squared Laguerre–Gaussian beams, self-focusing Laguerre–Gaussian beams, finite-energy Fourier–Bessel beams, and Tricomi beams. Although none of the above-listed beams are structurally stable, some of them are Fourier-invariant. The book will be of interest to a wide range of researchers and engineers engaged in optics, photonics, laser physics, optoinformation technologies, and optical instrumentation. It may also be useful to bachelor's and master's students in the specialties Applied Mathematics and Physics, Applied Mathematics and Informatics, and Optics, and to postgraduates in the indicated fields of science. (Fizmatlit Publishers: tel. +7 (495) 005-32-79; URL: <http://www.fml.ru/>, <https://www.fmlib.ru/>)

Sychev A P, Lavrov I V, Bardushkin V V *Physical and Mechanical Properties of Inhomogeneous Media with a Nested Microstructure (Theory and Modeling)*. (Rostov-on-Don: Publishing House SSC RAS, 2022) 316 pp. ISBN 978-5-4358-0229-0.

The monograph examines a number of theoretical aspects of predicting physical and mechanical properties of inhomogeneous media characterized by structure nesting, that is, such a mutual position of components that some of them are completely immersed in areas filled with other components. Particular attention is paid to describing the computational methods and numerical simulation of the values of physical and mechanical characteristics of matrix structures with inclusions in the shell. The first section is devoted to describing methods for predicting the dielectric, electrically conducting, optical, and thermophysical properties of inho-

mogeneous media with a nested microstructure. The second section describes methods for the simulation and calculation of effective local elastic and limiting strength properties of inhomogeneous media — fluid-saturated, microcapsulated, and water-containing mesoporous structures. (Federal Research Center — Southern Scientific Center of the Russian Academy of Sciences: e-mail: ssc-ras@ssc-ras.ru, URL: <https://www.ssc-ras.ru/>)

Kesselman V S *Mathematics in General Physics*. (Popular Scientific Literature Series) (Moscow–Izhevsk: Institute of Computer Science, 2023) 540 pp. ISBN 978-5-4344-0978-0.

The book presents the mathematical material used in general physics (from trigonometry to vector analysis) and additional material, including various topics: from the analysis of models in physics to numerical simulation. The application of probability theory is given based on the example of Maxwell distribution and the study of radioactive decay; Brownian motion is also considered as an example of a random process in physics. The measurement error theory is also described, and the general idea of the least squares method is presented. The book is intended for high-school students for a deeper study of physics and mathematics, as well as for entry-level university students and teachers of mathematics and physics, who can use the book's material in their classes. (Publishing House of Technical Literature, Institute of Computer Science: e-mail: mail@rcd.ru, URL: <https://shop.rcd.ru/>)

Meilikhov E Z *The Art of Writing Scientific Articles*. 2nd edition, suppl. (Dolgoprudny: Intellect, 2020) 336 pp. ISBN 978-5-91559-274-1.

Material published earlier in the author's book *Why and How to Write Scientific Papers* has been considerably revised and supplemented with allowance for the situation in the Russian scientific community. The additions consider new realities and an increased interest in the scientometric assessment of publications. The book is addressed to a wide range of readers — from senior students and postgraduates to active researchers. The first edition of the book is extremely popular among scientists, stimulating useful discussions and the development of new criteria. (Intellect Publishers: e-mail: solo@id-intellect.ru, URL <http://www.id-intellect.ru/>)

Prepared by *E V Zakharova*
(e-mail: elena.zakharova.office@gmail.com)