Physics and Astronomy

Springer and Palgrave Essential Textbooks

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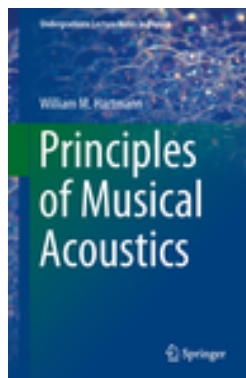
ISBN : 978-1-4614-6785-4

Hartmann, William M., Michigan State University, East Lansing, USA

Principles of Musical Acoustics

• A concise musical acoustics book intended for undergraduates with a basic understanding of math and science
• Discusses both the physics of sound, and the psychology and physiology of how humans perceive sound and music
• Includes chapters on the tonal characteristics and physics of musical instruments

Principles of Musical Acoustics focuses on the basic principles in the science and technology of music. Musical examples and specific musical instruments demonstrate the principles. The book begins with a study of vibrations and waves, in that order. These topics constitute the basic physical properties of sound, one of two pillars supporting the science of musical acoustics. The second pillar is the human element, the physiological and psychological aspects of acoustical science. The perceptual topics include loudness, pitch, tone color, and localization of sound. With these two pillars in place, it is possible to go in a variety of ...

Contents
Sound, Music, and Science.- Vibrations 1.- Vibrations 2.- Instrumentation.- Sound Waves.- Wave Properties.- Standing Waves.- Standing Waves in Pipes.- Fourier Analysis and Synthesis.- Sound Intensity.- The Auditory System.- Loudness Perception.- Pitch.- Localization of Sound.- Sound Environments.- Audio Transducers.- Distortion and Noise.- Audio Systems.- Loudspeakers.- Digital Audio.- Broadcasting.- Speech.- Brass Musical Instruments.- Woodwind Instruments.- String Instruments.- Percussion Instruments.- Electronic Music.

Fields of Interest
Acoustics; Neurobiology; Engineering Acoustics

Content Level

Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
2013,XIV, 348 p. 180 illus.(Undergraduate Lecture Notes in Physics) Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-662-53044-3

Karttunen, H., Kröger, P., Oja, H., Poutanen, M., Donner, K.J. (Eds.), University of Turku Tuorla Observatory, Piikkiö, Finland

Fundamental Astronomy

• The established, widely-adopted textbook for physical science majors as well as serious amateurs that gives a comprehensive, calculus-based introduction to the topics of classical and modern astronomy and astrophysics
• Richly illustrated with more than 400 images, including 36 color plates, that take you on a visual tour of the cosmos
• The sixth edition has further updated on extragalactic astronomy, cosmology and now includes a separate chapter on extra-solar planets

Now in its sixth edition, this successful undergraduate textbook gives a well-balanced and comprehensive introduction to the topics of classical and modern astronomy. While emphasizing both the astronomical concepts and the underlying physical principles, the text provides a sound basis for more profound studies in the astronomical sciences. The chapters on galactic and extragalactic astronomy as well as cosmology were extensively modernized in the previous

edition. In this new edition they have been further revised to include more recent results. The long chapter on the solar system has been split into two parts: the first one deals with ...

Contents
1. Introduction.- 2. Spherical Astronomy.- 3. Observations and Instruments.- 4. Photometric Concepts and Magnitudes.- 5. Radiation Mechanisms.- 6. Celestial Mechanics.- 7. The Solar System Part I.- 8. The Solar System Part II.- 9. Stellar Spectra.- 10. Binary Stars and Stellar Masses.- 11. <Stellar Structure.- 12. Stellar Evolution.- 13. The Sun.- 14. Variable Stars.- 15. Compact Stars.- 16. The Interstellar Medium.- 17. Star Clusters and Associations.- 18. The MilkyWay.- 19. Galaxies.- 20. Cosmology.- 21. Exoplanets.- 22. Astrobiology.-

Fields of Interest
Astronomy, Astrophysics and Cosmology; Geophysics/Geodesy; Popular Science in Astronomy

Content Level
Lower undergraduate

Product category
Undergraduate textbook

Available

Bibliography
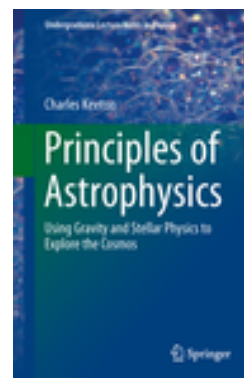6th ed. 2017,XIV, 550 p. 502 illus., 36 illus. in color. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-1-4614-9235-1

Keeton, Charles, Rutgers University, Piscataway, NJ, USA

Principles of Astrophysics

Using Gravity and Stellar Physics to Explore the Cosmos

• Provides a physics-centered analysis of a broad range of astronomical systems that appeals to a large audience of advanced undergraduate students in physics and engineering
• Illustrates estimation techniques that professional physicists and astronomers use in their research
• Emerges from lecture notes that have been used for nine years by three professors, all of whom have received Outstanding Teacher Awards from the Rutgers Society of Physics Students while teaching the course

This book gives a survey of astrophysics at the advanced undergraduate level, providing a physics-centred analysis of a broad range of astronomical systems. It originates from a two-semester course sequence at Rutgers University that is meant to appeal not only to astrophysics students but also more broadly to physics and engineering students. The organisation is driven more by physics than by astronomy; in other words, topics are first developed in physics and then applied to astronomical systems that can be investigated, rather than the other way around. The first half of the book focuses on gravity. The theme in this part of the book, as ...

Contents
Introduction: Tools of the Trade.- Part I: Using Gravity and Motion to Measure Mass.- Celestial Mechanics.- Gravitational One-Body Problem.- Gravitational Two-Body Problem.- Tidal Forces.- Gravitational Three-Body Problem.- Extended Mass Distributions: Spiral Galaxies.- N-Body Problem: Elliptical Galaxies.- Bending of Light by Gravity.- Relativity.- Cosmology: Expanding Universe.- Part II: Using Stellar Physics to Explore the Cosmos.- Planetary Atmospheres.- Planetary Temperatures.- Stellar Atmospheres.- Nuclear Fusion.- Stellar Structure and Evolution.- Stellar Remnants.- Charting the Universe with Stars.- Star and Planet Formation.- ...

Fields of Interest
Astronomy, Astrophysics and Cosmology; Classical and Quantum Gravitation, Relativity Theory; Classical Mechanics; Theoretical and Applied Mechanics

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
2014,XXI, 434 p. 119 illus., 37 illus. in color. (Undergraduate Lecture Notes in Physics)

Softcover
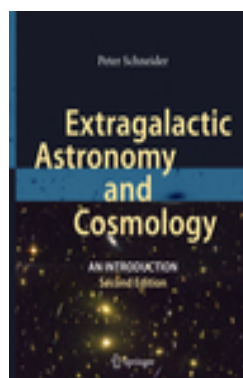
Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-642-54082-0

Schneider, Peter, Universität Bonn, Bonn, Germany

Extragalactic Astronomy and Cosmology

An Introduction

• Widely expanded second edition of this leading astronomy textbook now incorporates some of the most spectacular results from new observatories like the Galaxy Evolution Explorer, Herschel, ALMA, WMAP and Planck
• Provides an up-to-date coverage of all major results in observational cosmology lending impressive support for the standard model of the Universe
• Highly attractive and informative through lavish use of color figures

This second edition has been updated and substantially expanded. Starting with the description of our home galaxy, the Milky Way, this cogently written textbook introduces the reader to the astronomy of galaxies, their structure, active galactic nuclei, evolution and large scale distribution in the Universe. After an extensive and thorough introduction to modern observational and theoretical cosmology, the focus turns to the formation of structures and astronomical objects in the early Universe. The basics of classical astronomy and stellar astrophysics needed for extragalactic astronomy are provided in the appendix. While this book has ...

Contents
Introduction and overview.- The Milky Way as a galaxy.- The World of Galaxies.- Cosmology

I: Homogeneous isotropic world models.- Active galactic nuclei.- Clusters and groups of galaxies.- Cosmology II: Inhomogeneities in the Universe.- Cosmology III: The cosmological parameters.- The Universe at high redshift.- Galaxy evolution.- Outlook.- A: The electromagnetic radiation field.- B: Properties of stars.- C: Units and constants.- D: Recommended literature.- Index.

Fields of Interest
Astronomy, Astrophysics and Cosmology

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
2nd ed. 2015,XVIII, 626 p. 514 illus., 323 illus. in color. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity
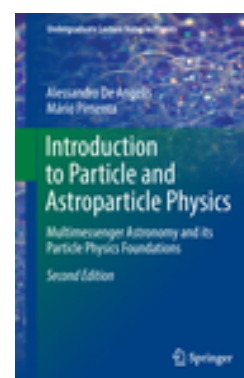
ISBN : 978-3-319-78180-8

De Angelis, Alessandro, Pimenta, Mário, University of Udine, Udine, Italy

Introduction to Particle and Astroparticle Physics

Multimessenger Astronomy and its Particle Physics Foundations

• Provides a balanced, university-level introduction to both (astro)particle physics and multimessenger astrophysics
• Updated to reflect the most recent discoveries
• Written by experimentalists actively working in the field of astroparticle physics and with

extensive experience in particle physics

This book introduces particle physics, astrophysics and cosmology. Starting from an experimental perspective, it provides a unified view of these fields that reflects the very rapid advances being made. This new edition has a number of improvements and has been updated to describe the recent discovery of gravitational waves and astrophysical neutrinos, which started the new era of multimessenger astrophysics; it also includes new results on the Higgs particle. Astroparticle and particle physics share a common problem: we still don't have a description of the main ingredients of the Universe from the point of view of its energy budget. …

Contents

Understanding the universe: particles and their interactions.- The birth and the basics of particle physics.- Cosmic rays and the development of particle physics.- Particle detection.- Particles and symmetries.- Interactions and field theories.- The Higgs mechanism and the standard model of particle physics.- The standard model of cosmology and the dark universe.- Neutrino oscillations and masses.- Messengers from the high-energy universe.- Astrobiology, and the relation of fundamental physics to life.

Fields of Interest

Astrophysics and Astroparticles; Particle and Nuclear Physics

Content Level

Upper undergraduate

Product category

Undergraduate textbook

Available

Bibliography

2nd ed. 2018,XXX, 733 p. 380 illus., 266 illus. in color.(Undergraduate Lecture Notes in Physics) Softcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-642-30255-8

Kippenhahn, R., Weigert, A., Weiss, A., MPI für Physik und Astrophysik Inst. Extraterrestrische Physik, Göttingen, Germany

Stellar Structure and Evolution

• Long awaited 2nd edition of a standard textbook
• Thoroughly updated in collaboration with Achim Weiss
• Famous for its clear pedagogical style

This long-awaited second edition of the classical textbook on Stellar Structure and Evolution by Kippenhahn and Weigert is a thoroughly revised version of the original text. Taking into account modern observational constraints as well as additional physical effects such as mass loss and diffusion, Achim Weiss and Rudolf Kippenhahn have succeeded in bringing the book up to the state-of-the-art with respect to both the presentation of stellar physics and the presentation and interpretation of current sophisticated stellar models. The well-received and proven pedagogical approach of the first edition has been retained. The book provides a …

Contents

Part I The Basic Equations.- 1 Coordinates, Mass Distribution, and Gravitational Field in Spherical Stars.- 2 Conservation of Momentum.- 3 The Virial Theorem.- 4 Conservation of Energy.- 5 Transport of Energy by Radiation and Conduction.- 6 Stability Against Local, Non-spherical Perturbations.- 7 Transport of Energy by Convection.- 8 The Chemical Composition.- 9 Mass Loss.- Part II The Overall Problem.- 10 The Differential Equations of Stellar Evolution.- 11 Boundary Conditions.- 12 Numerical Procedure.- Part III Properties of Stellar Matter.- 13 The Perfect Gas with Radiation.- 14 Ionization.- 15 The Degenerate Electron Gas.- 16 The …

Fields of Interest

Astrophysics and Astroparticles; Fluid- and Aerodynamics; Astronomy, Astrophysics and Cosmology; Nuclear Fusion

Content Level

Graduate

Product category

Graduate/advanced undergraduate textbook

Available

Bibliography

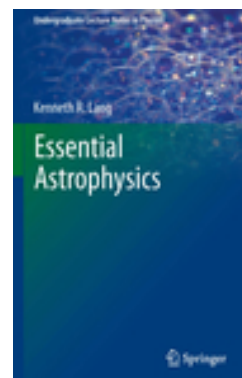2nd ed. 2012,XVIII, 606 p.(Astronomy and Astrophysics Library) Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-642-35962-0

Lang, Kenneth R., Department of Physics and Astronomy, Medford, MA, USA

Essential Astrophysics

• Presents astrophysics from basic principles without requiring any previous study of astronomy or astrophysics, or mathematical experience beyond basic algebra
• Provides 15 lecture-sized chapters and 50 set-aside focus elements with the intriguing historical development of particular themes which is missing in most astrophysics textbooks
• With problems and solutions

Essential Astrophysics is a book to learn or teach from, as well as a fundamental reference volume for anyone interested in astronomy and astrophysics. It presents astrophysics from basic principles without requiring any previous study of astronomy or astrophysics. It serves as a comprehensive introductory text, which takes the student through the field of astrophysics in lecture-sized chapters of basic physical principles applied to the cosmos. This one-semester overview will be enjoyed by undergraduate students with an interest in the physical sciences, such as astronomy, chemistry, engineering or physics, as well as by any

curious student ...

Contents
List of focus elements.- List of tables.- Preface.- 1. Observing the Universe.- 2. Radiation.- 3. Gravity.- 4. Cosmic Motion.- 5. Moving Particles.- 6. Detecting Atoms in Stars.- 7. Transmutation of Elements.- 8. What Makes the Sun Shine?.- 9. The Extended Solar Atmosphere.- 10. The Sun Amongst the Stars.- 11. The Material Between the Stars.- 12. Formation of the Stars and their Planets.- 13 Stellar End States.- 14 A Larger, Expanding Universe.- 15 Origin, Evolution, and Destiny of the Observable Universe.- Appendix I Constants.- Appendix II Units.- Appendix III Fundamental Equations.- Author index.- Subject index.

Fields of Interest
Astrophysics and Astroparticles; Space Sciences (including Extraterrestrial Physics, Space Exploration and Astronautics); Astrobiology

Content Level
Lower undergraduate

Product category
Undergraduate textbook

Available

Bibliography
2013,XXI, 635 p. 148 illus., 26 illus. in color. (Undergraduate Lecture Notes in Physics) Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-12681-4

Hobbie, Russell K., Roth, Bradley J., University of Minnesota, Minneapolis, MN, USA

Intermediate Physics for Medicine and Biology

• Bridges the gap between an introductory physics course and the physics needed by researchers and practitioners in medical physics, biological physics, biomedical engineering and medicine
• Includes a rich problem set to help students develop computational proficiency
• Emphasizes the application of physics at the organ and organism level Covers diagnostic imaging and radiation therapy

This classic text has been used in over 20 countries by advanced undergraduate and beginning graduate students in biophysics, physiology, medical physics, neuroscience, and biomedical engineering. It bridges the gap between an introductory physics course and the application of physics to the life and biomedical sciences. Extensively revised and updated, the fifth edition incorporates new developments at the interface between physics and biomedicine. New coverage includes cyclotrons, photodynamic therapy, color vision, x-ray crystallography, the electron microscope, cochlear implants, deep brain stimulation, nanomedicine, and other topics ...

Contents
Mechanics.- Exponential Growth and Decay.- Systems of Many Particles.- Transport in an Infinite Medium.- Transport Through Neutral Membranes.- Impulses in Nerve and Muscle Cells.- The Exterior Potential and the Electrocardiogram.- Biomagnetism.- Electricity and Magnetism at the Cellular Level.- Feedback and Control.- The Method of Least Squares and Signal Analysis.- Images.- Sound and Ultrasound.- Atoms and Light.- Interaction of Photons and Charged Particles with Matter.- Medical Use of X Rays.- Nuclear Physics and Nuclear Medicine.- Magnetic Resonance Imaging.

Fields of Interest
Biological and Medical Physics, Biophysics; Biomedical Engineering and Bioengineering; Neurosciences; Human Physiology; Physiological, Cellular and Medical Topics

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
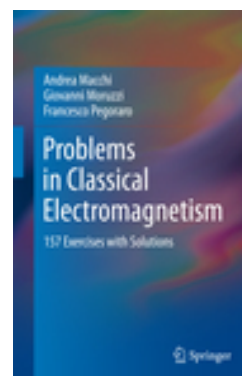5th ed. 2015,XX, 629 p. 667 illus., 18 illus. in color. Hardcover

Medium Type
Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-63132-5

Macchi, A., Moruzzi, G., Pegoraro, F., University of Pisa, Pisa, Italy

Problems in Classical Electromagnetism

157 Exercises with Solutions

• Presents a large set of new problems in electromagnetism, inspired by real phenomena and applications
• Provides full and detailed solutions including physical insight and discussions
• Includes advanced topics but without undue mathematical complexity

This book contains 157 problems in classical electromagnetism, most of them new and original compared to those found in other textbooks. Each problem is presented with a title in order to highlight its inspiration in different areas of physics or technology, so that the book is also a survey of historical discoveries and applications of classical electromagnetism. The solutions are complete and include detailed discussions, which take into account typical questions and mistakes by the students. Without unnecessary mathematical complexity, the problems and related discussions introduce the student to advanced concepts such as unipolar and ...

Contents
1 Basics of Electrostatics.- 2 Electrostatics of Conductors.- 3 Electrostatics of Dielectric Media.- 4 Electric Currents.- 5 Magnetostatics.- 6 Magnetic Induction.- 7 Electromagnetic Oscillators and Wave Propagation.- 8 Maxwell Equations and Conservation Laws.- 9 Relativistic Transformations of the Fields.- 10 Radiation Emission and Scattering.- 11 Electromagnetic Waves in Matter.- 12 Transmission Lines, Waveguides.- Resonant Cavities.- 13 Additional Problems.

Fields of Interest
Classical Electrodynamics; Atomic, Molecular, Optical and Plasma Physics; Microwaves, RF and Optical Engineering; Mathematical Applications in the Physical Sciences

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
1st ed. 2017,XVIII, 454 p. 113 illus. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-27875-9

Demtröder, Wolfgang, Demtröder, Germany

Mechanics and Thermodynamics

• Concise and accessible coverage of classical mechanics, thermodynamics and hydrodynamics
• Focusses on real life applications and transfer of theoretical knowledge to practical developments
• Contains numerous problems with detailed solutions

This introduction to classical mechanics and thermodynamics provides an accessible and clear treatment of the fundamentals. Starting with particle mechanics and an early introduction to special relativity this textbooks enables the reader to understand the basics in mechanics. The text is written from the experimental physics point of view, giving numerous real life examples and applications of classical mechanics in

technology. This highly motivating presentation deepens the knowledge in a very accessible way. The second part of the text gives a concise introduction to rotational motion, an expansion to rigid bodies, fluids and gases. ...

Contents
Mechanics and Thermodynamics.- Mechanics of a Point Mass.- Moving Coordinate Systems and Special Relativity.- Systems of Point Masses; Collisions.- Dynamics of Rigid Bodies.- Real Solid and Liquid Bodies.- Gases.- Liquid and Gases in Motion; Fluid Dynamics.- Vacuum Physics.- Thermodynamics.- Mechanical Oscillations and Waves.- Nonlinear Dynamics and Chaos.- Appendix.- Solutions of the Problems.

Fields of Interest
Classical Mechanics; Thermodynamics

Content Level
Lower undergraduate

Product category
Undergraduate textbook

Available

Bibliography
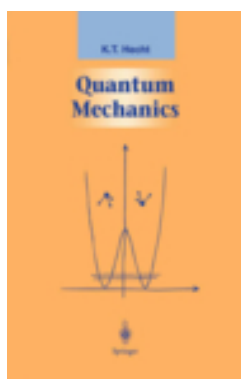1st ed. 2017,XV, 452 p. 615 illus. in color. (Undergraduate Lecture Notes in Physics) Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-0-387-98919-8

Hecht, K.T.

Quantum Mechanics

Intended for beginning graduate students,

this text takes the reader from the familiar coordinate representation of quantum mechanics to the modern algebraic approach, emphsizing symmetry principles throughout. After an introduction of the basic postulates and techniques, the book discusses time-independent perturbation theory, angular momentum, identical particles, scattering theory, and time-dependent perturbation theory. It concludes with several lectures on relativistic quantum mechanics and on many-body theory

Contents
I Introduction to Quantum Mechanics.- 1 Background: The Duality of Nature.- 2 The Motion of Wave Packets: Fourier Analysis.- 3 The Schrödinger Wave Equation and Probability Interpretation.- 4 Schrödinger Theory: The Existence of Discrete Energy Levels.- 5 Harmonic Oscillator Calculations.- 6 Further Interpretation of the Wave Function.- 7 The Eigenvalue Problem.- 8 Spherical Harmonics, Orbital Angular Momentum.- 9 ?-Step operators for the ? Equation.- 10 The Radial Functions for the Hydrogenic Atom.- 11 Shape-Invariant Potentials: Soluble One-Dimensional Potential Problems.- 12 The Darboux Method: Supersymmetric Partner Potentials.- 13 The ...

Fields of Interest
Classical Mechanics

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
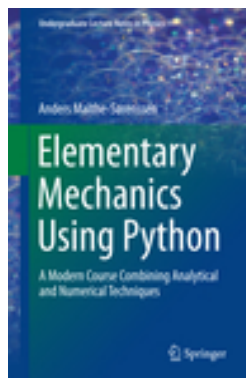2000,XIX, 760 p.(Graduate Texts in Contemporary Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-19595-7

Malthe-Sørenssen, Anders, University of Oslo, Oslo, Norway

Elementary Mechanics Using Python

A Modern Course Combining Analytical and Numerical Techniques

• Offers a novel approach combining computational and analytical methods
• Contains many figures and plots
• Each chapter comes with exercises and solutions

This book – specifically developed as a novel textbook on elementary classical mechanics – shows how analytical and numerical methods can be seamlessly integrated to solve physics problems. This approach allows students to solve more advanced and applied problems at an earlier stage and equips them to deal with real-world examples well beyond the typical special cases treated in standard textbooks. Another advantage of this approach is that students are brought closer to the way physics is actually discovered and applied, as they are introduced right from the start to a more exploratory way of understanding phenomena and of developing their ...

Contents

Introduction.- Getting started with programming.- Units and measurement.- Motion in one dimension.- Forces in one dimension.- Motion in two and three dimensions.- Forces in two and three dimensions.- Constrained motion.- Forces and constrained motion.- Work.- Energy.- Momentum, impulse, and collisions.- Multiparticle systems.- Rotational motion.- Rotation of rigid bodies.- Dynamics of rigid bodies.- Proofs.- Solutions.- Index.

Fields of Interest

Classical Mechanics; Numerical and Computational Physics, Simulation; Mathematical Methods in Physics

Content Level

Lower undergraduate

Product category

Undergraduate textbook

Available

Bibliography

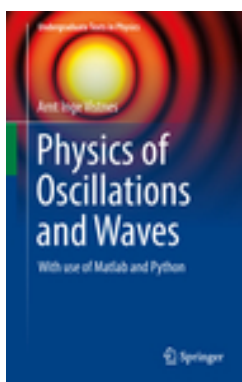2015,XIII, 590 p. 256 illus., 180 illus. in color. (Undergraduate Lecture Notes in Physics) Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-72313-6

Vistnes, Arnt Inge, University of Oslo, Oslo, Norway

Physics of Oscillations and Waves

With use of Matlab and Python

• Uses both mathematics and numerical methods to give physics students insights not offered by traditional physics teaching
• Rectifies misconceptions on many matters, even including how musical instruments work
• Discusses the interesting interplay between time and frequency more deeply than most textbooks

In this textbook a combination of standard mathematics and modern numerical methods is used to describe a wide range of natural wave phenomena, such as sound, light and water waves, particularly in specific popular contexts, e.g. colors or the acoustics of musical instruments. It introduces the reader to the basic physical principles that allow the description of the oscillatory motion of matter and classical fields, as well as resulting concepts including interference, diffraction, and coherence. Numerical methods offer new scientific insights and make it possible to handle interesting cases that can't readily be addressed using analytical ...

Contents

Chapter 1: Introduction.- Chapter 2: Free and damped oscillations.- Chapter 3: Forced oscillations and resonance.- Chapter 4: Numerical methods.- Chapter 5: Fourier analysis.- Chapter 6: Waves.- Chapter 7: Sound.- Chapter 8: Dispersion and surface waves on water.- Chapter 9: Electromagnetic waves.- Chapter 10: Reflection, transmission and polarization.- Chapter 11: Measurements of light, dispersion of light, colours.- Chapter 12: Geometric optics.- Chapter 13: Interference, diffraction.- Chapter 14: Wavelet transformation.- Chapter 15: Coherence, dipole radiation and lasers.- Chapter 16: Skin depth and wave guides.

Fields of Interest

Classical Mechanics; Mathematical Methods in Physics; Numerical and Computational Physics, Simulation; Atmospheric Sciences; Fluid- and Aerodynamics

Content Level

Upper undergraduate

Product category

Undergraduate textbook

Available

Bibliography

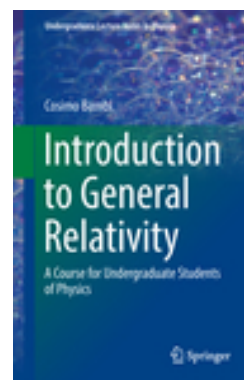1st ed. 2018,XVIII, 576 p. 273 illus., 257 illus. in color.(Undergraduate Texts in Physics) Softcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-981-13-1089-8

Bambi, Cosimo, Fudan University, Shanghai, China

Introduction to General Relativity

A Course for Undergraduate Students of Physics

• Offers an introduction for students of theoretical physics
• Presents the calculations step by step, as in class
• Covers recent advances in gravitational wave astronomy

Following the approach of Lev Landau and Evgenii Lifshitz, this book introduces the theory of special and general relativity with the Lagrangian formalism and the principle of least action. This method allows the complete theory to be constructed starting from a small number of assumptions, and is the most natural approach in modern theoretical physics. The book begins by reviewing Newtonian mechanics and Newtonian gravity with the Lagrangian formalism and the principle of least action, and then moves to special and general relativity. Most calculations are presented step by step, as is done on the board in class. The book covers recent ...

Contents

Introduction.- Special Relativity.- Relativistic mechanics.- Electromagnetism.- Riemannian Geometry.- General Relativity.- Einstein's Gravity.- Schwarzschild Spacetime.- Classical Tests of General Relativity.- Black Holes.- Cosmological Models.- Gravitational waves.

Fields of Interest

Classical and Quantum Gravitation, Relativity Theory; Astronomy, Astrophysics and Cosmology

Content Level

Upper undergraduate

Product category

Undergraduate textbook

Available

Bibliography

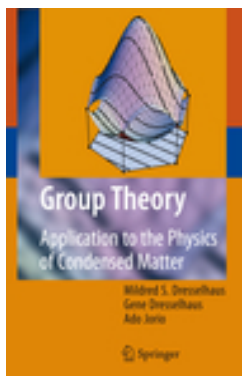1st ed. 2018,XVI, 335 p. 39 illus., 35 illus. in color.(Undergraduate Lecture Notes in Physics) Softcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-540-32897-1

Dresselhaus, M.S., Dresselhaus, G., Jorio, A., Massachusetts Institute of Technology Dept. Electrical Engineering &, Cambridge, MA, USA

Group Theory

Application to the Physics of Condensed Matter

• Unique pedagogical textbook by the gifted Professor Mildred Dresselhaus

Every process in physics is governed by selection rules that are the consequence of symmetry requirements. The beauty and strength of group theory resides in the transformation of many complex symmetry operations into a very simple linear algebra. This concise and class-tested book has been pedagogically tailored over 30 years MIT and 2 years at the University Federal of Minas Gerais (UFMG) in Brazil. The approach centers on the conviction that teaching group theory in close connection with applications helps students to learn, understand and use it for their own needs. For this reason, the theoretical background is confined to the first 4 ...

Contents

Basic Mathematics.- Basic Mathematical Background: Introduction.- Representation Theory and Basic Theorems.- Character of a Representation.- Basis Functions.- Introductory Application to Quantum Systems.- Splitting of Atomic Orbitals in a Crystal Potential.- Application to Selection Rules and Direct Products.- Molecular Systems.- Electronic States of Molecules and Directed Valence.- Molecular Vibrations, Infrared, and Raman Activity.- Application to Periodic Lattices.- Space Groups in Real Space.- Space Groups in Reciprocal Space and Representations.- Electron and Phonon Dispersion Relation.- Applications to Lattice Vibrations.- Electronic ...

Fields of Interest

Condensed Matter Physics; Group Theory and Generalizations; Theoretical, Mathematical and Computational Physics; Mathematical Methods in Physics; Optical and Electronic Materials

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Content Level

Graduate

Product category

Graduate/advanced undergraduate textbook

Available

Bibliography

2008,XV, 582 p. Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-540-93803-3

Ibach, Harald, Lüth, Hans, Forschungszentrum Jülich, Jülich, Germany

Solid-State Physics

An Introduction to Principles of Materials Science

• Comprehensive overview of solid-state physics
• Includes current topics of high importance, such as superconductors, nanostructures and Quantum-Hall systems
• Enlarged and updated edition of very popular title, completly updated chapters on semi- and superconductors.

This new edition of the well-received introduction to solid-state physics provides a comprehensive overview of the basic theoretical and experimental concepts of materials science. Experimental aspects and laboratory details are highlighted in separate panels that enrich text and emphasize recent developments. Notably, new material in the fourth edition includes sections on important devices, aspects of non-periodic structures of matter, phase transitions, defects, superconductors and nanostructures. Especially the chapters on super- and on semiconductivity had been completely

updated, inlcuding new developments and new figures. Students will ...

Contents
Chemical Bonding in Solids.- Structure of Solid Matter.- Diffraction from Periodic Structures.- Dynamics of Atoms in Crystals.- Thermal Properties.- #x201C;Free#x201D; Electrons in Solids.- The Electronic Bandstructure of Solids.- Magnetism.- Motion of Electrons and Transport Phenomena.- Superconductivity.- Dielectric Properties of Materials.- Semiconductors.

Fields of Interest
Condensed Matter Physics; Solid State Physics; Spectroscopy and Microscopy; Physical Chemistry; Engineering, general; Strongly Correlated Systems, Superconductivity

Content Level
Research

Product category
Graduate/advanced undergraduate textbook

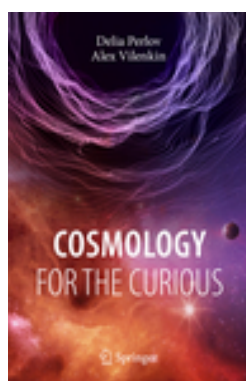Available

Bibliography
4th ed. 2009,XIV, 536 p. Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-57038-9

Perlov, Delia, Vilenkin, Alex, Tufts University, Medford, MA, USA

Cosmology for the Curious

• The big questions of cosmology made simple - for students and the educated layman alike
• Accessible, informative and entertaining,

with a gripping style and delightful cartoons
• Ideal for a first course in cosmology, also for non-science majors and high-school pupils

This book is a gentle introduction for all those wishing to learn about modern views of the cosmos. Our universe originated in a great explosion – the big bang. For nearly a century cosmologists have studied the aftermath of this explosion: how the universe expanded and cooled down, and how galaxies were gradually assembled by gravity. The nature of the bang itself has come into focus only relatively recently. It is the subject of the theory of cosmic inflation, which was developed in the last few decades and has led to a radically new global view of the universe.Students and other interested readers will find here a non-technical but ...

Contents
Part I The Big Bang and the Observable Universe: A historical overview.- Newton's universe.- Special relativity.- The fabric of space and time.- An expanding universe.- Observational cosmology.- Hubble's law and the expanding universe.- The fate of the universe.- Dark matter and dark energy.- The quantum world.- The hot big bang.- Structure formation.- Element abundances.- The very early universe.- Part II Beyond the Big Bang: Problems with the big bang.- The theory of cosmic inflation.- Testing inflation: predictions and observations.- Eternal inflation.- String theory and the multiverse.- Anthropic selection.- The principle of mediocrity.- ...

Fields of Interest
Cosmology; Classical and Quantum Gravitation, Relativity Theory; Particle and Nuclear Physics; History and Philosophical Foundations of Physics; Philosophy of Religion

Content Level
Popular/general

Product category
Undergraduate textbook

Available

Bibliography
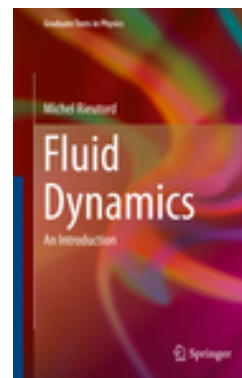1st ed. 2017,XIV, 372 p. 202 illus., 63 illus. in color. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-09350-5

Rieutord, Michel, Université Paul Sabatier, Toulouse, France

Fluid Dynamics

An Introduction

• Does not assume any previous knowledge in fluid mechanics
• Provides a step-by-step progression into the subject
• Offers basic mathematics which is often required for beginners

This book is dedicated to readers who want to learn fluid dynamics from the beginning. It assumes a basic level of mathematics knowledge that would correspond to that of most second-year undergraduate physics students and examines fluid dynamics from a physicist's perspective. As such, the examples used primarily come from our environment on Earth and, where possible, from astrophysics. The text is arranged in a progressive and educational format, aimed at leading readers from the simplest basics to more complex matters like turbulence and magnetohydrodynamics. Exercises at the end of each chapter help readers to test their understanding of ...

Contents
The foundations of fluid mechanics.- The static of fluids.- Flow of Perfect Fluids.- Flows of incompressible viscous fluids.- Waves in Fluids.- Flows Instabilities.- Thermal Convection.- Rotating Fluids.- Turbulence.- Magnetohydrodynamics.- Beyond Fluid Mechanics.- Complements of mathematics.- The solutions of exercises.

Fields of Interest
Fluid- and Aerodynamics; Astrophysics and Astroparticles; Engineering Fluid Dynamics; Geophysics/Geodesy

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
2015,XVI, 508 p. 124 illus., 10 illus. in color.
(Graduate Texts in Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-1-4939-6570-0

Bonamente, Massimiliano, University of Alabama, Huntsville, AL, USA

Statistics and Analysis of Scientific Data

• Introduces the statistical techniques most commonly employed in physical sciences and engineering
• Makes clear distinction between material that is strictly mathematical and theoretical, and practical applications of statistical methods
• Expanded to cover selected core statistical methods used in business science

The revised second edition of this textbook provides the reader with a solid foundation in probability theory and statistics as applied to the physical sciences, engineering and related fields. It covers a broad range of numerical and analytical methods that are essential for the correct analysis of scientific data, including probability theory, distribution functions of statistics, fits to two-dimensional data and parameter estimation, Monte Carlo methods and Markov chains. Features new to this edition include: • a discussion of statistical techniques employed in business science, such as multiple regression analysis of multivariate ...

Contents
Theory of Probability.- Random Variables and Their Distribution.- Sum and Functions of Random Variables.- Estimate of Mean and Variance and Confidence Intervals.- Median,

Weighted Mean and Linear Average (NEW).- Distribution Function of Statistics and Hypothesis Testing.- Maximum Likelihood Fit to a Two-Variable Dataset.- Goodness of Fit and Parameter Uncertainty.- Systematic Errors and Intrinsic Scatter (NEW).- Fitting Data with Bivariate Errors (NEW).- Comparison Between Models.- Monte Carlo Methods.- Markov Chains and Monte Carlo Markov Chains.- Statistics for Business Sciences and Addition of Multi–Variate Analysis (NEW).

Fields of Interest
Mathematical Methods in Physics; Statistics for Engineering, Physics, Computer Science, Chemistry and Earth Sciences; Statistics for Business, Management, Economics, Finance, Insurance; Mathematical and Computational Engineering; Complex Systems; Statistical Physics and Dynamical Systems

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
2nd ed. 2017,XVII, 318 p. 40 illus., 4 illus. in color.(Graduate Texts in Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-03761-5

Brandt, Siegmund, University of Siegen, Siegen, Germany

Data Analysis

Statistical and Computational Methods for Scientists and Engineers

• Provides rigorous mathematical treatment

of practical statistical methods for data analysis
• Serves as a graduate textbook and reference guide for those interested in the fundamentals of data analysis
• Useful for all fields of science and engineering requiring an understanding of statistical methods applied to experimental data

The fourth edition of this successful textbook presents a comprehensive introduction to statistical and numerical methods for the evaluation of empirical and experimental data. Equal weight is given to statistical theory and practical problems. The concise mathematical treatment of the subject matter is illustrated by many examples and for the present edition a library of Java programs has been developed. It comprises methods of numerical data analysis and graphical representation as well as many example programs and solutions to programming problems. The book is conceived both as an introduction and as a work of reference. In particular it ...

Contents
Introduction.- Probabilities.- Random Variables: Distributions.- Computer-Generated Random Numbers: The Monte Carlo Method.- Some Important Distributions and Theorems.- Samples.- The Method of Maximum Likelihood.- Testing Statistical Hypotheses.- The Method of Least Squares.- Function Minimization.- Analysis of Variance.- Linear and Polynomial Regression.- Time-Series Analysis.- A) Matrix Calculations.- B) Combinatorics.- C) Formulas and Methods for the Computation of Statistical Functions.- D) The Gamma Function and Related Functions: Methods and Programs for their Computation.- E) Utility Programs.- F) The Graphics Class DatanGraphics.- G) ...

Fields of Interest
Mathematical Methods in Physics; Mathematical and Computational Engineering; Statistics for Engineering, Physics, Computer Science, Chemistry and Earth Sciences; Math. Applications in Chemistry; Numerical and Computational Physics, Simulation

Content Level
Graduate

Product category
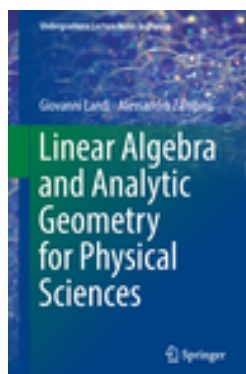Graduate/advanced undergraduate textbook

Available

Bibliography
4th ed. 2014,XX, 523 p. 134 illus. Hardcover

Medium Type
Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-78360-4

Landi, Giovanni, Zampini, Alessandro, University of Trieste, Trieste, Italy

Linear Algebra and Analytic Geometry for Physical Sciences

• In-depth, self-contained textbook for students in physical sciences
• With more than 200 examples and solved exercises
• The mathematical formalism is motivated and introduced by problems from physics

A self-contained introduction to finite dimensional vector spaces, matrices, systems of linear equations, spectral analysis on euclidean and hermitian spaces, affine euclidean geometry, quadratic forms and conic sections. The mathematical formalism is motivated and introduced by problems from physics, notably mechanics (including celestial) and electro-magnetism, with more than two hundreds examples and solved exercises. Topics include: The group of orthogonal transformations on euclidean spaces, in particular rotations, with Euler angles and angular velocity. The rigid body with its inertia matrix. The unitary group. Lie algebras and …

Contents
Introduction.- Vectors and coordinate systems.- Vector spaces.- Euclidean vector spaces.- Matrices.- The determinant.- Systems of linear equations.- Linear transformations.- Dual spaces.- Endomorphisms and diagonalization.- Spectral theorems on euclidean spaces.- Rotations.- Spectral theorems on hermitian spaces.- Quadratic forms.- Affine linear geometry.- Euclidean affine linear geometry.- Conic sections.- A Algebraic Structures.- A.1 A few notions of Set Theory.- A.2 Groups.- A.3 Rings and Fields.- A.4 Maps between algebraic structures.- A5 Complex numbers.- A.6 Integers modulo a prime number.

Fields of Interest
Mathematical Methods in Physics; Linear and Multilinear Algebras, Matrix Theory; Mathematical and Computational Engineering; Geometry; Math Applications in Computer Science; Mathematical Applications in the Physical Sciences

Content Level
Lower undergraduate

Product category
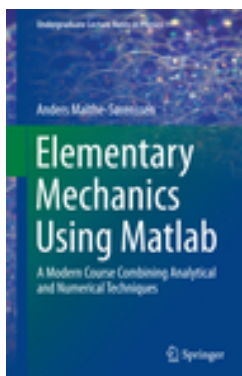Undergraduate textbook

Available

Bibliography
1st ed. 2018,XII, 345 p.(Undergraduate Lecture Notes in Physics) Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-19586-5

Malthe-Sørenssen, Anders, University of Oslo, Oslo, Norway

Elementary Mechanics Using Matlab

A Modern Course Combining Analytical and Numerical Techniques

• Novel approach combining computational and analytical methods
• Contains many figures and plots
• Each chapter comes with exercises and solutions

This book – specifically developed as a novel textbook on elementary classical mechanics – shows how analytical and numerical methods can be seamlessly integrated to solve physics problems. This approach allows students to solve more advanced and applied problems

at an earlier stage and equips them to deal with real-world examples well beyond the typical special cases treated in standard textbooks. Another advantage of this approach is that students are brought closer to the way physics is actually discovered and applied, as they are introduced right from the start to a more exploratory way of understanding phenomena and of developing their …

Contents
 Introduction.- Getting started with programming.- Units and measurement.- Motion in one dimension.- Forces in one dimension.- Motion in two and three dimensions.- Forces in two and three dimensions.- Constrained motion.- Forces and constrained motion.- Work.- Energy.- Momentum, impulse, and collisions.- Multiparticle systems.- Rotational motion.- Rotation of rigid bodies.- Dynamics of rigid bodies.- Proofs.- Solutions.- Index.

Fields of Interest
Mathematical Methods in Physics; Classical Mechanics; Numerical and Computational Physics, Simulation

Content Level
Lower undergraduate

Product category
Undergraduate textbook
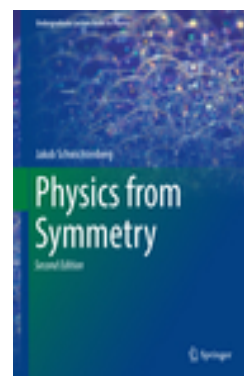
Available

Bibliography
2015,XIII, 590 p. 255 illus., 178 illus. in color. (Undergraduate Lecture Notes in Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-66630-3

Schwichtenberg, Jakob, Karlsruhe, Germany

Physics from Symmetry

• A highly praised new approach to teaching basic physics based on symmetry principles
• Self-contained and pedagogical presentation
• Reveals the inner consistency and elegance of theoretical physics in a way no textbook has done before

This is a textbook that derives the fundamental theories of physics from symmetry. It starts by introducing, in a completely self-contained way, all mathematical tools needed to use symmetry ideas in physics. Thereafter, these tools are put into action and by using symmetry constraints, the fundamental equations of Quantum Mechanics, Quantum Field Theory, Electromagnetism, and Classical Mechanics are derived. As a result, the reader is able to understand the basic assumptions behind, and the connections between the modern theories of physics. The book concludes with first applications of the previously derived equations. Thanks to the input ...

Contents
Part I Foundations: Introduction.- Special Relativity.- Part II Symmetry Tools: Lie Group Theory.- The Framework.- Part III The Equations of Nature: Measuring Nature.- Free Theory.- Interaction Theory.- Part IV Applications: Quantum Mechanics.- Quantum Field Theory.- Classical Mechanics.- Electrodynamics.- Gravity.- Closing Words.- Part V Appendices: Vector Calculus.- Calculus.- Linear Algebra.- Additional Mathematical Notions.

Fields of Interest
Mathematical Methods in Physics; Mathematical Physics; Particle and Nuclear Physics; Topological Groups, Lie Groups

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
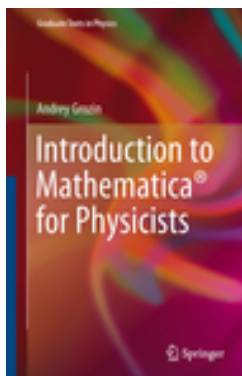2nd ed. 2018,XXI, 287 p. 28 illus., 15 illus. in color.(Undergraduate Lecture Notes in Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-00893-6

Grozin, Andrey, Budker Institute of Nuclear Physics, Novosibirsk, Russia

Introduction to Mathematica® for Physicists

• Features in-depth introduction to Mathematica
• Uses examples from physical sciences to illustrate the value of Mathematica
• Concisely teaches students the basics of the Mathematica language and some fundamental algorithms, without unnecessary detail

The basics of computer algebra and the language of Mathematica are described in this textbook, leading towards an understanding of Mathematica that allows the reader to solve problems in physics, mathematics, and chemistry. Mathematica is the most widely used system for doing mathematical calculations by computer, including symbolic and numeric calculations and graphics. It is used in physics and other branches of science, in mathematics, education and many other areas.

Contents
Part I Lectures.- Computer algebra systems.- Overview of Mathematica.- Expressions. -Patterns and substitutions.- Functions.- Mathematica as a programming language.- Gröbner bases.- Calculus.- Risch algorithm.- Linear algebra.- Input--output and strings.- Packages.- Part II Computer classes.- Plots.- Trigonometric functions.- Quantum oscillator.- Spherical harmonics.- Adding angular momenta in quantum mechanics.- Classical nonlinear oscillator.- Cyclohexane.- Multi-ζ functions.- Quantum nonlinear oscillator.- Riemann curvature tensor.- Rainbow.- Problems for students.

Fields of Interest
Numerical and Computational Physics, Simulation; Computer Applications in Chemistry; Particle and Nuclear Physics; Mathematical Applications in the Physical Sciences

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
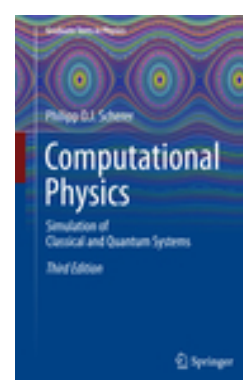2014,X, 219 p.(Graduate Texts in Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-61087-0

Scherer, Philipp O.J., Technische Universität München, Garching, Germany

Computational Physics

Simulation of Classical and Quantum Systems

• Teaches basic numerical methods in theoretical physics
• Features numerous computer examples, for which no programming skills are required
• Provides detailed explanations without mathematical proofs

This textbook presents basic numerical methods and applies them to a large variety of physical models in multiple computer experiments. Classical algorithms and more recent methods are explained. Partial differential equations are treated generally comparing important methods, and equations of motion are solved by a large number of simple as well as more sophisticated methods. Several modern algorithms for quantum wavepacket motion are compared. The first part of the book discusses the basic numerical methods, while the second part simulates classical and quantum systems. Simple but non-trivial examples from a broad range of physical topics ...

Contents

I. Numerical Methods.- Error Analysis.- Interpolation.- Numerical Differentiation.- Numerical Integration.- Systems of Inhomogeneous Linear Equations.- Roots and Extremal Points.- Fourier Transformation.- Wavelets.- Random Numbers and Monte Carlo Methods.- Eigenvalue Problems.- Data Fitting.- Discretization of Differential Equations.- Equations of Motion.- II. Simulation of Classical and Quantum Systems.- Rotational Motion.- Molecular Mechanics.- Continuum Mechanics.- Thermodynamic Systems.- Random Walk and Brownian Motion.- Electrostatics.- Waves.- Diffusion.- Convection.- Nonlinear Systems.- Simple Quantum Systems.- Quantum Many -Body ...

Fields of Interest

Numerical and Computational Physics, Simulation; Mathematical Applications in the Physical Sciences; Mathematical and Computational Engineering; Theoretical and Computational Chemistry

Content Level

Graduate

Product category

Graduate/advanced undergraduate textbook

Available

Bibliography

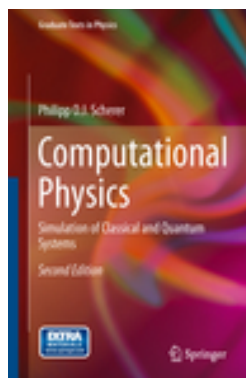3rd ed. 2017,XXIV, 633 p. 306 illus., 50 illus. in color.(Graduate Texts in Physics) Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-00400-6

Scherer, Philipp, Technische Universität München, Garching, Germany

Computational Physics

Simulation of Classical and Quantum Systems

• Features numerous computer examples; no programming skills necessary
• Includes separate parts on numerical methods and simulations
• Gives detailed explanations without mathematical proofs

This textbook presents basic and advanced computational physics in a very didactic style. It contains very-well-presented and simple mathematical descriptions of many of the most important algorithms used in computational physics. The first part of the book discusses the basic numerical methods. The second part concentrates on simulation of classical and quantum systems. Several classes of integration methods are discussed including not only the standard Euler and Runge Kutta method but also multi-step methods and the class of Verlet methods, which is introduced by studying the motion in Liouville space. A general chapter on the numerical ...

Contents

Part I Numerical Methods.- Error Analysis.- Interpolation.- Numerical Differentiation.- Numerical Integration.- Systems of Inhomogeneous Linear Equations.- Roots and Extremal Points.- Fourier Transformation.- Random Numbers and Monte-Carlo Methods.- Eigenvalue Problems.- Data Fitting.- Discretization of Differential Equations.- Equations of Motion.- Part II Simulation of Classical and Quantum Systems.- Rotational Motion.- Molecular Dynamics.- Thermodynamic Systems.- Random Walk and Brownian Motion.- Electrostatics.- Waves.- Diffusion.- Nonlinear Systems.- Simple Quantum Systems.

Fields of Interest

Numerical and Computational Physics, Simulation; Mathematical Applications in the Physical Sciences; Mathematical and Computational Engineering; Theoretical and Computational Chemistry

Content Level

Graduate

Product category

Graduate/advanced undergraduate textbook

Available

Bibliography

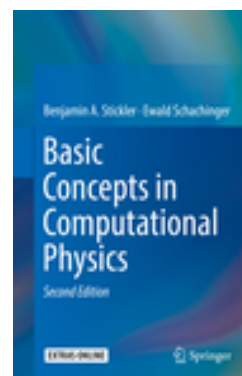2nd ed. 2013,XVIII, 454 p.(Graduate Texts in Physics) Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-27263-4

Stickler, Benjamin A., Schachinger, Ewald, University of Duisburg-Essen, Duisburg, Germany

Basic Concepts in Computational Physics

• Now with ready to use C++ program code available online
• Contains heavily expanded chapters on molecular dynamics, PDEs, random generators, Monte Carlo applications, data analysis and data optimization
• Presents deterministic methods are presented on a par with stochastic methods

This new edition is a concise introduction to the basic methods of computational physics. Readers will discover the benefits of numerical methods for solving complex mathematical problems and for the direct simulation of physical processes. The book is divided into two main parts: Deterministic methods and stochastic methods in computational physics. Based on concrete problems, the first part discusses numerical differentiation and integration, as well as the treatment of ordinary differential equations. This is extended by a brief introduction to the numerics of partial differential equations. The second part deals with the generation of ...

Contents

Some Basic Remarks.- Part I Deterministic Methods.- Numerical Differentiation.- Numerical Integration.- The KEPLER Problem.- Ordinary Differential Equations – Initial Value Problems.- The Double Pendulum.- Molecular Dynamics.- Numerics of Ordinary Differential Equations - Boundary Value Problems.- The One-Dimensional Stationary Heat Equation.- The One-Dimensional Stationary SCHRÖDINGER Equation.- Partial Differential Equations.- Part II Stochastic Methods.- Pseudo Random Number Generators.- Random Sampling Methods.- A Brief Introduction to Monte-Carlo Methods.- The

ISING Model.- Some Basics of Stochastic Processes.- The Random Walk and ...

Fields of Interest
Numerical and Computational Physics, Simulation; Mathematical and Computational Engineering; Computational Mathematics and Numerical Analysis; Theoretical and Computational Chemistry

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

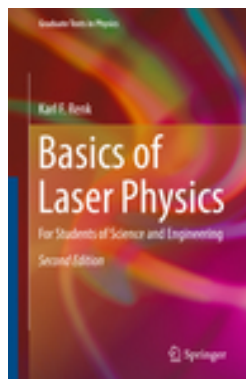**Bibliography**
2nd ed. 2016,XVI, 409 p. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-50650-0

Renk, Karl F., Universität Regensburg, Regensburg, Germany

Basics of Laser Physics

For Students of Science and Engineering

• Covers all types of lasers, including semiconductor lasers and free-electron lasers
• Structured in a modular form, so that a student can study a particular chapter without reading all the preceding ones
• Includes problems and solutions and over 400 illustrations

This textbook provides an introductory presentation of all types of lasers. It contains a general description of the laser, a theoretical treatment and a characterization of its operation as it deals with gas, solid state, free-

electron and semiconductor lasers. This expanded and updated second edition of the book presents a description of the dynamics of free-electron laser oscillation using a model introduced in the first edition that allows a reader to understand basic properties of a free-electron laser and makes the difference to "conventional" lasers. The discussions and the treatment of equations are presented in a way that a reader ...

Contents
Part I - General Description of a Laser and an Example.- Part II - Theoretical Basis of the Laser.- Part III - Operation of a Laser.- Part IV - Types of Lasers (Except Semiconductor Lasers).- Part V - Semiconductor Lasers.- Part VI - Laser Related Topics.

Fields of Interest
Optics, Lasers, Photonics, Optical Devices; Microwaves, RF and Optical Engineering; Classical Electrodynamics; Manufacturing, Machines, Tools, Processes

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
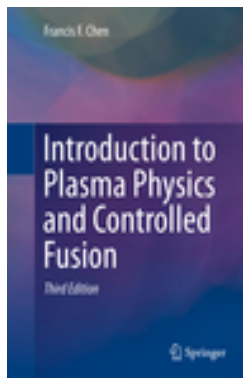2nd ed. 2017,XIX, 676 p. 344 illus., 7 illus. in color.(Graduate Texts in Physics) Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-22308-7

Chen, Francis, University of California at Los Angeles, Los Angeles, CA, USA

Introduction to Plasma Physics

and Controlled Fusion

• Third edition of this bestselling textbook providing a coherent and easy-to-understand introduction to plasma physics and controlled fusion
• Updates all existing chapters and includes two additional chapters on Special Plasmas and Plasma Applications
• Contains new and advanced problem sets in each chapter

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 ...

Contents
Introduction.- Single-particle motions.- Plasmas as fluids.- Waves in plasmas.- Diffusion and resistivity.- Equilibrium and stability.- Kinetic theory .- Nonlinear effects.- Special plasmas.- Plasma applications.

Fields of Interest
Plasma Physics; Nuclear Energy; Nuclear Energy; Space Sciences (including Extraterrestrial Physics, Space Exploration and Astronautics); Classical Electrodynamics

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
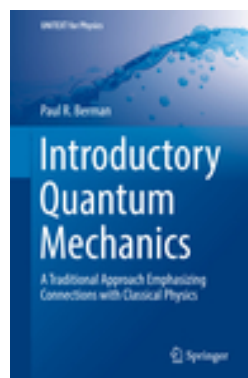3rd ed. 2016,XII, 490 p. 312 illus. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-68596-0

Berman, Paul R., University of Michigan, Ann Arbor, MI, USA

Introductory Quantum Mechanics

A Traditional Approach Emphasizing Connections with Classical Physics

• Uses software programs such as Mathematica to illustrate results of many calculations
• Collects problems carefully designed to illustrate and expand upon textual material
• Contains physically based treatments of such topics as angular momentum and scattering

This book presents a basic introduction to quantum mechanics. Depending on the choice of topics, it can be used for a one-semester or two-semester course. An attempt has been made to anticipate the conceptual problems students encounter when they first study quantum mechanics. Wherever possible, examples are given to illustrate the underlying physics associated with the mathematical equations of quantum mechanics. To this end, connections are made with corresponding phenomena in classical mechanics and electromagnetism. The problems at the end of each chapter are intended to help students master the course material and to explore more ...

Contents

Introduction.- Mathematical Introduction.- Free Particle Schroedinger Equation - Free-Particle Wave Packets.- Schroedinger's Equation with Potential Energy: Introduction to Operators.- Postulates and Basic Elements of Quantum Mechanics: Properties of Operators.- Problems in 1-dimension: General Considerations, Infinite Well Potential, Piecewise Constant Potentials, and Delta Function Potentials.- Simple Harmonic Oscillator - One Dimension.- Problems in 2 and 3-dimensions - General Considerations.- Central Forces and Angular Momentum.- Spherically Symmetric Potentials - Radial Equation.- Dirac Notation.- Spin.- Important Basics from Phys ...

Fields of Interest

Quantum Physics; Elementary Particles, Quantum Field Theory; Mathematical Applications in the Physical Sciences; Classical Mechanics

Content Level

Upper undergraduate

Product category

Undergraduate textbook

Available

Bibliography

1st ed. 2018,XVI, 637 p. 101 illus., 82 illus. in color.(UNITEXT for Physics) Hardcover
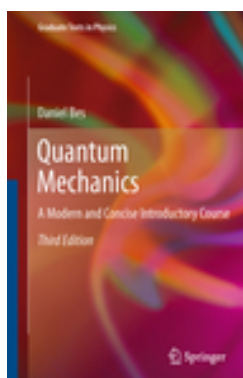
Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-642-20555-2

Bes, Daniel, Comision Nacional de Energia Atomica Centro Atomico Constituyentes, Buenos Aires, Argentina

Quantum Mechanics

A Modern and Concise Introductory Course

• The presentation in the new edition of this well-reviewed textbook is clear and goes to the core of the questions
• The balance between principles, concepts and applications is optimal
• The material presented is touching active areas of physics

Starting from basic principles, the book covers a wide variety of topics, ranging from Heisenberg, Schroedinger, second quantization, density matrix and path integral formulations of quantum mechanics, to applications that are (or will be) corner stones of present and future technologies. The emphasis is on spin waves, quantum information, recent tests of quantum physics and decoherence. The book provides a large amount of information without unbalancing the flow of the main ideas by laborious detail.

Contents

Introduction.- The Principles of Quantum Mechanics.- Other Consequences of the Basic Principles.- The Heisenberg Realization of Quantum.- The Schroedinger Realization of Quantum Physics.- Angular Momenta.- Three-Dimensional Hamiltonian.- Many-Body Problems.- Approximate Solutions to Quantum Problems.- Time-Dependence in Quantum Mechanics.- Broken Symmetries.- Entanglement and Experimental Tests of Quantum Mechanics.- Quantum Information.- Other Formulations of Quantum Mechanics: the Density Matrix and the Path Integral.- The Classical and Quantum Realities. Decoherence and Measurements.- A Brief History of Quantum Mechanics.

Fields of Interest

Quantum Physics; Quantum Field Theories, String Theory

Content Level

Graduate

Product category

Graduate/advanced undergraduate textbook

Available

Bibliography

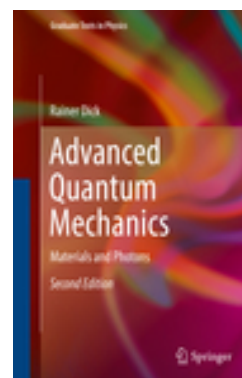3rd ed. 2012,XXII, 298 p.(Graduate Texts in Physics) Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-25674-0

DICK, RAINER, University of Saskatchewan,

Saskatoon, SK, Canada

Advanced Quantum Mechanics

Materials and Photons

• Introduces quantum mechanics with a unique focus on examples and applications in materials science and photon-matter interactions
• Presents advanced quantum mechanics clearly enough to make it accessible to graduate students in physics, chemistry and engineering
• New and updated edition includes an additional 62 new problems to aid in student's comprehension

In this updated and expanded second edition of a well-received and invaluable textbook, Prof. Dick emphasizes the importance of advanced quantum mechanics for materials science and all experimental techniques which employ photon absorption, emission, or scattering. Important aspects of introductory quantum mechanics are covered in the first seven chapters to make the subject self-contained and accessible for a wide audience. Advanced Quantum Mechanics, Materials and Photons can therefore be used for advanced undergraduate courses and introductory graduate courses which are targeted towards students with diverse academic backgrounds from the ...

Contents

The Need for Quantum Mechanics.- Self-adjoint Operators and Eigenfunction Expansions.- Simple Model Systems.- Notions from Linear Algebra and Bra-Ket Formalism.- Formal Developments.- Harmonic Oscillators and Coherent States.- Central Forces in Quantum Mechanics.- Spin and Addition of Angular Momentum Type Operators.- Stationary Perturbations in Quantum Mechanics.- Quantum Aspects of Materials I.- Scattering Off Potentials.- The Density of States.- Time-Dependent Perturbations in Quantum Mechanics.- Path Integrals in Quantum Mechanics.- Coupling to Electromagnetic Fields.- Principles of Lagrangian Field Theory.- Non-relativistic Quantum ...

Fields of Interest

Quantum Physics; Quantum Optics; Optical and Electronic Materials; Nanoscale Science and Technology; Nanotechnology

Content Level

Graduate

Product category

Graduate/advanced undergraduate textbook

Available

Bibliography

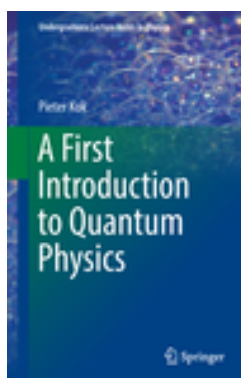2nd ed. 2016,XIX, 692 p. 63 illus., 36 illus. in color.(Graduate Texts in Physics) Hardcover

Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-92206-5

Kok, Pieter, University of Sheffield, Sheffield, UK

A First Introduction to Quantum Physics

• Explores key concepts in quantum theory using the simplest physical systems
• Advances quantum theory with only simple mathematics that is developed as it is needed
• Illustrates each key concept with modern examples such as gravitational wave detection, atomic clocks, magnetic resonance imaging, and the scanning tunneling microscope

In this undergraduate textbook, the author develops the quantum theory from first principles based on very simple experiments: a photon travelling through beam splitters to detectors, an electron moving through a Stern-Gerlach machine, and an atom emitting radiation. From the physical description of these experiments follows a natural mathematical description in terms of matrices and complex numbers. The first part of the book examines how experimental facts force us to let go of some deeply held preconceptions and develops this idea into a mathematical description of states, probabilities, observables, and time evolution using physical ...

Contents

Chapter 1: Three simple experiments.- The purpose of physical theories.- A laser and a detector.- A laser and a beam splitter.- A Mach-Zehnder interferometer.- The breakdown of classical concepts.- Chapter 2: Photons and Interference.- Photon paths and superpositions.- The beam splitter as a matrix.- The phase in an interferometer.- How to calculate probabilities.- Gravitational wave detection.- Chapter 3: Electrons with Spin.- The Stern-Gerlach experiment.- The spin observable.- The Bloch sphere.- The uncertainty principle.- Magnetic resonance imaging.- Chapter 4: Atoms and Energy.- The energy spectrum of atoms.- Changes over time.- The ...

Fields of Interest

Quantum Physics; Mathematical Methods in Physics; Quantum Field Theories, String Theory; Mathematical Applications in the Physical Sciences

Content Level

Lower undergraduate

Product category

Undergraduate textbook

Available

Bibliography

1st ed. 2018,IX, 243 p. 63 illus., 2 illus. in color. (Undergraduate Lecture Notes in Physics) Softcover
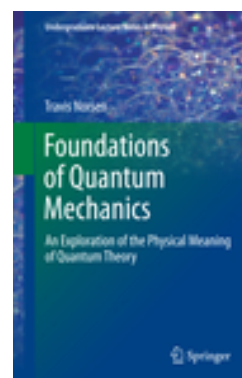
Medium Type

Book

Imprint

Springer

Order Quantity

ISBN : 978-3-319-65866-7

Norsen, Travis, Smith College, Northampton, MA, USA

Foundations of Quantum Mechanics

An Exploration of the Physical Meaning of Quantum Theory

• Comprehensive, authoritative, and carefully organized introduction to quantum

foundations
• Accessible to students with just one semester of quantum wave mechanics
• End-of-chapter problems afford unique opportunities for engagement and discovery

Authored by an acclaimed teacher of quantum physics and philosophy, this textbook pays special attention to the aspects that many courses sweep under the carpet. Traditional courses in quantum mechanics teach students how to use the quantum formalism to make calculations. But even the best students - indeed, especially the best students - emerge rather confused about what, exactly, the theory says is going on, physically, in microscopic systems. This supplementary textbook is designed to help such students understand that they are not alone in their confusions (luminaries such as Albert Einstein, Erwin Schroedinger, and John Stewart Bell ...

Contents
Pre-Quantum Theories.- Quantum Examples.- The Measurement Problem.- The Locality Problem.- The Ontology Problem.- The Copenhagen Interpretation.- The Pilot-Wave Theory.- Bell's Theorem.- The Spontaneous Collapse Theory.- The Many-Worlds Theory.

Fields of Interest
Quantum Physics; Philosophy of Science; History and Philosophical Foundations of Physics

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
1st ed. 2017,XV, 310 p. 70 illus., 12 illus. in color.(Undergraduate Lecture Notes in Physics) Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-030-00463-7

Pade, Jochen, Universität Oldenburg, Oldenburg, Germany

Quantum Mechanics for Pedestrians 1

Fundamentals

• Provides a fresh approach to quantum mechanics by combining standard topics with novel aspects
• Promotes learning with a wealth of exercises and problems with solutions
• Discusses more advanced topics and additional basic knowledge in the appendix

This book, the first in a two-volume set, provides an introduction to the fundamentals of (mainly) non-relativistic quantum mechanics. This first volume chiefly focuses on the essential principles, while applications and extensions of the formalism can be found in volume 2. Including but also moving beyond material that is covered in traditional textbooks on quantum mechanics, the book discusses in detail current issues such as interaction-free quantum measurements or neutrino oscillations, as well as fundamental problems and epistemological questions, such as the measurement problem. A chapter on the postulates of quantum mechanics rounds ...

Contents
Towards the Schrödinger Equation.- Polarization.- More on the Schrödinger Equation.- Complex Vector Spaces and Quantum Mechanics.- Two Simple Solutions of the Schrödinger Equation.- Interaction-Free Measurement.- Position Probability.- Neutrino Oscillations.- Expectation Values, Mean Values, and Measured Values.- Stopover; then on to Quantum Cryptography.- Abstract Notation.- Continuous Spectra.- Operators.- Postulates of Quantum Mechanics.

Fields of Interest
Quantum Physics; Quantum Field Theories, String Theory; Mathematical Applications in the Physical Sciences; Quantum Information Technology, Spintronics; Mathematical Methods in Physics

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Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
2nd ed. 2018,XXIII, 522 p. 53 illus., 29 illus. in color.(Undergraduate Lecture Notes in Physics) Softcover
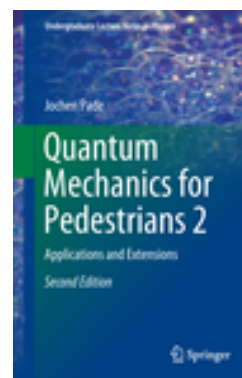
Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-030-00466-8

Pade, Jochen, Universität Oldenburg, Oldenburg, Germany

Quantum Mechanics for Pedestrians 2

Applications and Extensions

• Written by an experienced lecturer with a sound understanding of quantum mechanics, and a gift for explaining it
• Combines standard topics with new findings and developments, such as quantum information and neutrino oscillation
• Discusses more advanced topics in the appendix, and includes many exercises with solutions

This book, the second in a two-volume set, provides an introduction to the basics of (mainly) non-relativistic quantum mechanics. While the first volume addresses the basic principles, this second volume discusses applications and extensions to more complex problems. In addition to topics dealt with in traditional quantum mechanics texts, such as symmetries or many-body problems, it also treats issues of current interest such as

entanglement, Bell's inequality, decoherence and various aspects of quantum information in detail. Furthermore, questions concerning the basis of quantum mechanics and epistemological issues which are relevant e.g. ...

Contents
One-Dimensional Piecewise-Constant Potentials.- Angular Momentum.- The Hydrogen Atom.- The Harmonic Oscillator.- Perturbation Theory.- Entanglement, EPR, Bell.- Symmetries and Conservation Laws.- The Density Operator.- Identical Particles.- Decoherence.- Scattering.- Quantum Information.- Is Quantum Mechanics Complete?.- Interpretations of Quantum Mechanics.

Fields of Interest
Quantum Physics; Quantum Field Theories, String Theory; Mathematical Applications in the Physical Sciences; Quantum Information Technology, Spintronics

Content Level
Upper undergraduate

Product category
Undergraduate textbook

Available

Bibliography
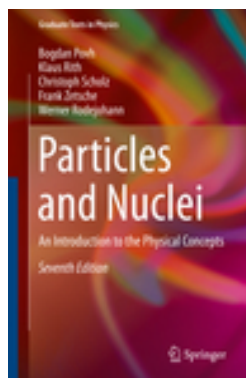2nd ed. 2018,XXIII, 586 p. 1381 illus., 53 illus. in color.(Undergraduate Lecture Notes in Physics) Softcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-662-46320-8

Povh, B., Rith, K., Scholz, C., Zetsche, F., Rodejohann, W., Max-Planck-Institut für Kernphysik, Heidelberg, Germany

Particles and Nuclei

An Introduction to the Physical Concepts

• To cope with modern developments, especially in nuclear physics research, this textbook presents nuclear and particle physics from a unifying point of view
• New sections on weak interaction, Baryons and neutrino physics
• Excellent phenomenological approach to the physics of particles and nuclei

This well-known introductory textbook gives a uniform presentation of nuclear and particle physics from an experimental point of view. The first part, Analysis, is devoted to disentangling the substructure of matter. This part shows that experiments designed to uncover the substructures of nuclei and nucleons have a similar conceptual basis, and lead to the present picture of all matter being constructed from a small number of elementary building blocks and a small number of fundamental interactions. The second part, Synthesis, shows how the elementary particles may be combined to build hadrons and nuclei. The fundamental interactions, which ...

Contents
Hors d'oeuvre.- Analysis: The Building Blocks of Matter.- Global Properties of Nuclei.- Nuclear Stability.- Scattering.- Geometric Shapes of Nuclei.- Elastic Scattering off Nucleons.- Deep Inelastic Scattering.- Quarks, Gluons, and the Strong Interaction.- Particle Production in e+e− Collisions.- Phenomenology of the Weak Interaction.- Neutrino Oscillations and Neutrino Mass.- Exchange Bosons of the Weak Interaction and the Higgs Boson.- The Standard Model.- Synthesis: Composite Systems.- Quarkonia.- Mesons.- The Baryons.- The Nuclear Force.- The Structure of Nuclei.- Collective Nuclear Excitations.- Nuclear Thermodynamics.- Many-Body ...

Fields of Interest
Quantum Physics; Elementary Particles, Quantum Field Theory

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
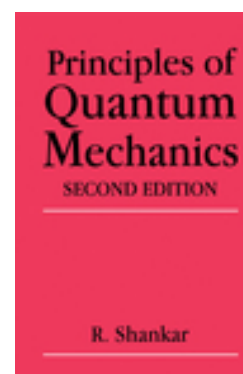7th ed. 2015,XIII, 458 p. 210 illus., 1 illus. in color.(Graduate Texts in Physics) Hardcover

Medium Type
Book

Imprint

Springer

Order Quantity

ISBN : 978-0-306-44790-7

Shankar, R.

Principles of Quantum Mechanics

R. Shankar has introduced major additions and updated key presentations in this second edition of Principles of Quantum Mechanics. New features of this innovative text include an entirely rewritten mathematical introduction, a discussion of Time-reversal invariance, and extensive coverage of a variety of path integrals and their applications. Additional highlights include: - Clear, accessible treatment of underlying mathematics - A review of Newtonian, Lagrangian, and Hamiltonian mechanics - Student understanding of quantum theory is enhanced by separate treatment of mathematical theorems and physical postulates - Unsurpassed coverage of ...

Contents
1. Mathematical Introduction.- 1.1. Linear Vector Spaces: Basics.- 1.2. Inner Product Spaces.- 1.3. Dual Spaces and the Dirac Notation.- 1.4. Subspaces.- 1.5. Linear Operators.- 1.6. Matrix Elements of Linear Operators.- 1.7. Active and Passive Transformations.- 1.8. The Eigenvalue Problem.- 1.9. Functions of Operators and Related Concepts.- 1.10. Generalization to Infinite Dimensions.- 2. Review of Classical Mechanics.- 2.1. The Principle of Least Action and Lagrangian Mechanics.- 2.2. The Electromagnetic Lagrangian.- 2.3. The Two-Body Problem.- 2.4. How Smart Is a Particle?.- 2.5. The Hamiltonian Formalism.- 2.6. The Electromagnetic Force ...

Fields of Interest
Quantum Physics; Mathematical Methods in Physics; Theoretical, Mathematical and Computational Physics; Classical Mechanics;

Elementary Particles, Quantum Field Theory

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available
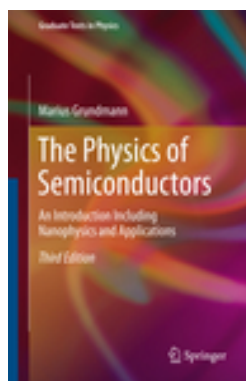
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2nd ed. 1994,XVIII, 676 p. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-23879-1

Grundmann, Marius, Universität Leipzig, Leipzig, Germany

The Physics of Semiconductors

An Introduction Including Nanophysics and Applications

• Offers a new expanded and updated edition of the best existing textbook on semiconductors
• Connects semiconductor material physics with devices and nanostructures
• Gives a broad and balanced coverage of all semiconductor materials incl. silicon/ germanium, III-V, II-VI, oxides

The 3rd edition of this successful textbook contains ample material for a comprehensive upper-level undergraduate or beginning graduate course, guiding readers to the point where they can choose a special topic and begin supervised research. The textbook provides a balance between essential aspects of solid-state and semiconductor physics, on the one hand, and the principles of various semiconductor devices and their applications in electronic and photonic devices, on the other. It highlights many practical aspects of

semiconductors such as alloys, strain, heterostructures, nanostructures, that are necessary in modern semiconductor research ...

Contents

Introduction.- Part I Fundamentals.- Bonds.- Crystals.- Defects.- Mechanical Properties.- Band Structure.- Electronic Defect States.- Transport.- Optical Properties.- Recombination.- Part II Selected Topcis.- Surfaces.- Heterostructures.- External Fields.- Nanostructures.- Polarized Semiconductors.- Magnetic Semiconductors.- Organic Semiconductors.- Graphene and Carbon Nanotubes.- Dielectric Structures.- Transparent Conductive Oxide Semiconductors.- Part III Applications.- Diodes.- Light-to-Electricity Conversion.- Electricity-to-Light Conversion.- Transistors.

Fields of Interest

Semiconductors; Nanoscale Science and Technology; Electronics and Microelectronics, Instrumentation; Solid State Physics

Content Level
Upper undergraduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
3rd ed. 2016,XXXIX, 989 p. 855 illus., 200 illus. in color.(Graduate Texts in Physics) Hardcover
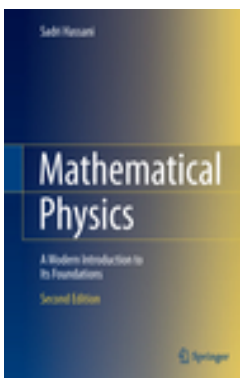
Medium Type
Book

Imprint
Springer

Order Quantity

ISBN : 978-3-319-01194-3

Hassani, Sadri, Illinois State University Department of Physics, Normal, IL, USA

Mathematical Physics

A Modern Introduction to Its Foundations

• Appreciated for its balance between rigor and physical application
• New chapters on algebras, representation of Clifford algebras and spinors, fiber bundles, and gauge theories
• Includes historical notes and over 900 worked-out examples.

The goal of this book is to expose the reader to the indispensable role that mathematics plays in modern physics. Starting with the notion of vector spaces, the first half of the book develops topics as diverse as algebras, classical orthogonal polynomials, Fourier analysis, complex analysis, differential and integral equations, operator theory, and multi-dimensional Green's functions. The second half of the book introduces groups, manifolds, Lie groups and their representations, Clifford algebras and their representations, and fibre bundles and their applications to differential geometry and gauge theories. This second edition is a ...

Contents
Mathematical Preliminaries.- I Finite-Dimensional Vector Spaces.- 1 Vectors and Linear Maps.- 2 Algebras.- 3 Operator Algebra.- 4 Matrices.- 5 Spectral Decomposition.- II Infinite-Dimensional Vector Spaces.- 6 Hilbert Spaces.- 7 Classical Orthogonal Polynomials.- 8 Fourier Analysis.- III Complex Analysis.- 9 Complex Calculus.- 10 Calculus of Residues.- 11 Advanced Topics.- IV Differential Equations.- 12 Separation of Variables in Spherical Coordinates.- 13 Second-Order Linear Differential Equations.- 14 Complex Analysis of SOLDEs.- 15 Integral Transforms and Differential Equations.- V Operators on Hilbert Spaces.- 16 Introductory Operator ...

Fields of Interest
Theoretical, Mathematical and Computational Physics; Mathematical Methods in Physics; Numerical and Computational Physics, Simulation; Applications of Mathematics

Content Level
Graduate

Product category
Graduate/advanced undergraduate textbook

Available

Bibliography
2nd ed. 2013,XXXI, 1205 p. 160 illus. Hardcover

Medium Type
Book

Imprint
Springer

Order Quantity