Optics

Introduction to Quantum Optics
From Light Quanta to Quantum Teleportation
Harry Paul
Humboldt University
Translated by Igor Jex
FNSPE Czech Technical University of Prague

This textbook provides a physical understanding of what photons are and of their properties and applications. Special emphasis is made in the text to entangled photon pairs which exhibit quantum mechanical correlations over manifestly macroscopic distances. In addition, non-classical properties of light, such as photon antibunching and squeezing, as well as quantum phase measurement and optical tomography are discussed. The author describes relevant experiments and elucidates the physical ideas behind them. This book will be of interest to undergraduate and graduate students studying optics, and to any physicist with an interest in the mysteries of the photon and exciting modern work in quantum cryptography and teleportation.

Contents:

2004 247 x 174 mm 254pp
37 line diagrams 0 521 83563 1 HB £35.00

Principles of Lasers and Optics
William S. C. Chang
University of California, San Diego

Principles of Lasers and Optics describes both the fundamental principles of the laser and the propagation and application of laser radiation in bulk and guided-wave components. All solid state, gas and semiconductor lasers are analyzed uniformly as macroscopic devices with susceptibility originated from quantum mechanical interactions to develop an overall understanding of the coherent nature of laser radiation. Topics covered include discussions on how laser radiation should be analyzed, the macroscopic differences and similarities of various analyses, special techniques, types of lasers and setting up laser analyses. This text will be useful for first year graduates in electrical engineering and physics.


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Elements of the Random Walk
An Introduction for Advanced Students and Researchers
Joseph Rudnick
University of California, Los Angeles

and George Gaspari
University of California, Santa Cruz

Random walks have proven to be a useful model in understanding processes across a wide spectrum of scientific disciplines. *Elements of the Random Walk* is an introduction to some of the most powerful and general techniques used in the application of these ideas. Although the reader is introduced to modern analytical tools, such as path-integrals and field-theoretical formalism, the book is self-contained in that basic concepts are developed and relevant fundamental findings fully discussed. Mathematical background is provided in supplements at the end of each chapter, when appropriate. This self-contained text will appeal to graduate students across science, engineering and mathematics who need to understand the applications of random walk techniques, as well as to established researchers.

Contents:
1. Introduction to techniques;
2. Generating functions I;
3. Generating functions II: recurrence, sites visited and the role of dimensionality;
4. Boundary conditions, steady state and the electrostatic analogy;
5. Variations on the random walk;
6. The shape of a random walk;
7. Path integrals and self-avoidance;
8. Properties of the random walk: introduction to scaling;
9. Scaling of walks and critical phenomena;
10. Walks and the O(n) model: mean field theory and spin waves;
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12. More on the renormalization group.

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Equilibrium and Non-Equilibrium Statistical Thermodynamics
Michel Le Bellac
Université de Nice, Sophia Antipolis

Fabrice Mortessagne
Université de Nice, Sophia Antipolis

and G. George Batrouni
Université de Nice, Sophia Antipolis

This text gives a self-contained exposition of fundamental topics in modern equilibrium and nonequilibrium statistical thermodynamics. The text follows a balanced approach between the macroscopic (thermodynamic) and microscopic (statistical) points of view. The first half of the book deals with equilibrium thermodynamics and statistical mechanics. In addition to standard subjects, the reader will find a detailed account of broken symmetries, critical phenomena and the renormalization group, as well as an introduction to numerical methods. The second half of the book is devoted to nonequilibrium phenomena, first following a macroscopic approach, with hydrodynamics as an important example. Kinetic theory receives a thorough treatment through analysis of the Boltzmann-Lorentz model and the Boltzmann equation. The book concludes with general nonequilibrium methods such as linear response, projection method and the Langevin and Fokker-Planck equations, including numerical simulations.

Contents:
Preface; 1. Thermodynamics;
2. Statistical entropy and Boltzmann distribution;
3. Canonical and grand-canonical ensembles;
4. Critical phenomena;
5. Quantum statistics;
6. Irreversible processes: macroscopic theory;
7. Numerical simulations;
8. Irreversible processes: kinetic theory;
9. Topics in non-equilibrium statistical mechanics;
10. Appendices.

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The study of the electronic structure of materials is at a momentous stage, with new algorithms and computational methods and rapid advances in basic theory. Many properties of materials can now be determined directly from the fundamental equations for the electrons, providing new insights into critical problems in physics, chemistry, and materials science. This book provides a unified exposition of the basic theory and methods of electronic structure, together with instructive examples of practical computational methods and real-world applications. This book is appropriate for both graduate students and practising scientists. It describes the approach most widely used today, density functional theory, with emphasis upon understanding the ideas, practical methods and limitations. Many references are provided to original papers, pertinent reviews, and widely available books. Included in each chapter is a short list of the most relevant references and a set of exercises that reveal salient points and challenge the reader.

- Provides practical examples and applications
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- Extensive exercises are included within each chapter


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David Yevick, University of Waterloo, Ontario

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Peter Szekeres, University of Adelaide

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