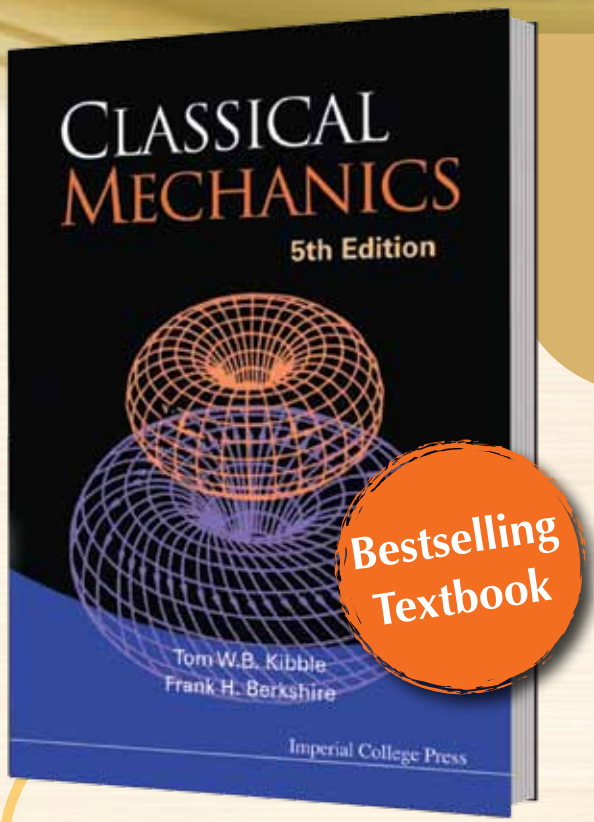
CLASSICAL MECHANICS (5th Edition)

by **Tom W B Kibble** *(FRS, Imperial College)*
Frank H Berkshire *(Imperial College)*



Tom Kibble is Senior Research Fellow and Emeritus Professor of Theoretical Physics at Imperial College London, and a Fellow of the Royal Society. He has published many articles on theoretical particle physics and cosmology.

Frank Berkshire is also at Imperial College London. He is Senior Lecturer and Director of Undergraduate Studies in the Department of Mathematics, and has published on dynamical systems, waves and fluids. He was elected as Imperial College Teaching Fellow in 1996. Both authors have long experience of lecturing to physics and applied mathematics students.

This is the fifth edition of a well-established textbook. It is intended to provide a thorough coverage of the fundamental principles and techniques of classical mechanics, an old subject that is at the base of all of physics, but in which there has also in recent years been rapid development. The book is aimed at undergraduate students of physics and applied mathematics. It emphasizes the basic principles, and aims to progress rapidly to the point of being able to handle physically and mathematically interesting problems, without getting bogged down in excessive formalism. Lagrangian methods are introduced at a relatively early stage, to get students to appreciate their use in simple contexts. Later chapters use Lagrangian and Hamiltonian methods extensively, but in a way that aims to be accessible to undergraduates, while including modern developments at the appropriate level of detail. The subject has been developed considerably recently while retaining a truly central role for all students of physics and applied mathematics.

This edition retains all the main features of the fourth edition, including the two chapters on geometry of dynamical systems and on order and chaos, and the new appendices on conics and on dynamical systems near a critical point. The material has been somewhat expanded, in particular to contrast continuous and discrete behaviours. A further appendix has been added on routes to chaos (period-doubling) and related discrete maps. The new edition has also been revised to give more emphasis to specific examples worked out in detail.

Classical Mechanics is written for undergraduate students of physics or applied mathematics. It assumes some basic prior knowledge of the fundamental concepts and reasonable familiarity with elementary differential and integral calculus.

Contents: Linear Motion; Energy and Angular Momentum; Central Conservative Forces; Rotating Frames; Potential Theory; The Two-Body Problem; Many-Body Systems; Rigid Bodies; Lagrangian Mechanics; Small Oscillations and Normal Modes; Hamiltonian Mechanics; Dynamical Systems and Their Geometry; Order and Chaos in Hamiltonian Systems; Appendices: Vectors; Conics; Phase Plane Analysis Near Critical Points; Discrete Dynamical Systems — Maps.

Readership: Undergraduates in physics and applied mathematics.

"… the student who requires a good book on the older aspects of Classical Mechanics together with a brief introduction to newer ideas will find the third edition useful."

Contemporary Physics

"This volume, by Kibble and Berkshire, has proved to be a successful book … the written content and presentation are all excellent."

European Journal of Physics

"Classical Mechanics by T Kibble and F Berkshire is tailor-made for budding theoreticians. It lays the groundwork for relativity and quantum theory, quickly progressing beyond Newtonian mechanics to the alternative formulations of Joseph Lagrange and William Hamilton."

New Scientist

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Mathematical Reviews

This second edition extends and improves on the first, already an acclaimed and original treatment of statistical concepts insofar as they impact theoretical physics and form the basis of modern thermodynamics. This book illustrates through myriad examples the principles and logic used in extending the simple laws of idealized Newtonian physics and quantum physics into the real world of noise and thermal fluctuations.

In response to the many helpful comments by users of the first edition, important features have been added in this second, new and revised edition. These additions allow a more coherent picture of thermal physics to emerge. Benefiting from the expertise of the new co-author, the present edition includes a detailed exposition — occupying two separate chapters — of the renormalization group and Monte-Carlo numerical techniques, and of their applications to the study of phase transitions. Additional figures have been included throughout, as have new problems. A new Appendix presents fully worked-out solutions to representative problems; these illustrate various methodologies that are peculiar to physics at finite temperatures, that is, to statistical physics.

This new edition incorporates important aspects of many-body theory and of phase transitions. It should better serve the contemporary student, while offering to the instructor a wider selection of topics from which to craft lectures on topics ranging from thermodynamics and random matrices to thermodynamic Green functions and critical exponents, from the propagation of sound in solids and fluids to the nature of quasiparticles in quantum liquids and in transfer matrices.

Contents: Elementary Concepts in Statistics and Probability; The Ising Model and the Lattice Gas; Elements of Thermodynamics; Statistical Mechanics; The World of Bosons; All About Fermions: Theories of Metals, Superconductors, Semiconductors; Kinetic Theory; The Transfer Matrix; Monte Carlo and Other Computer Simulation Methods; Critical Phenomena and the Renormalization Group; Some Uses of Quantum Field Theory in Statistical Physics.

Readership: Upper-level undergraduates, graduate students, academics and researchers in statistical physics.

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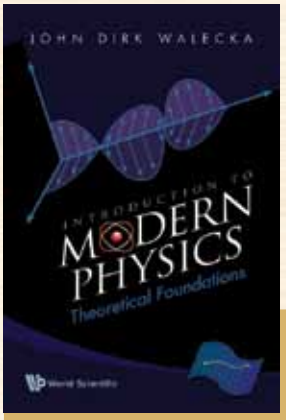

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Physics Today

About the Author

Professor Walecka is Governor's Distinguished CEBAF Professor of Physics, Professor Emeritus at Stanford University and Professor of Physics at the College of William and Mary. He was the Scientific Director of the Continuous Electron Beam Accelerator Facility (CEBAF) in its initial stage (from 1986 to 1992). He was awarded the Bonner Prize for Nuclear Physics by the American Physical Society and was a Distinguished Schiff Lecturer and Primakoff Lecturer. For his many contributions to research, administration, and teaching, he was awarded the Virginia Lifetime Achievement in Science.

Our understanding of the physical world was revolutionized in the twentieth century — the era of "modern physics". This book, aimed at the very best students, presents the foundations and frontiers of today's physics. It focuses on the following topics: quantum mechanics; applications in atomic, nuclear, particle, and condensed-matter physics; special relativity; relativistic quantum mechanics, including the Dirac equation and Feynman diagrams; quantum fields; and general relativity. The aim is to cover these topics in sufficient depth such that things "make sense" to students and they can achieve an elementary working knowledge of them. Many problems are included, a great number of which take dedicated readers just as far as they want to go in modern physics. Although the book is designed so that one can, in principle, read and follow the text without doing any of the problems, the reader is urged to attempt as many of them as possible. Several appendices help bring the reader up to speed on any additional required mathematics. With very few exceptions, the reader should then find the text, together with the appendices and problems, to be self-contained.

Contents: Classical Physics; Some Contradictions; Quantum Mechanics; Atomic Physics; Nuclear Physics; Particle Physics; Special Relativity; Relativistic Quantum Mechanics; General Relativity; Quantum Fluids; Quantum Fields; Problems.

Readership: Upper-level undergraduate physics or science students, research scientists and engineers.

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