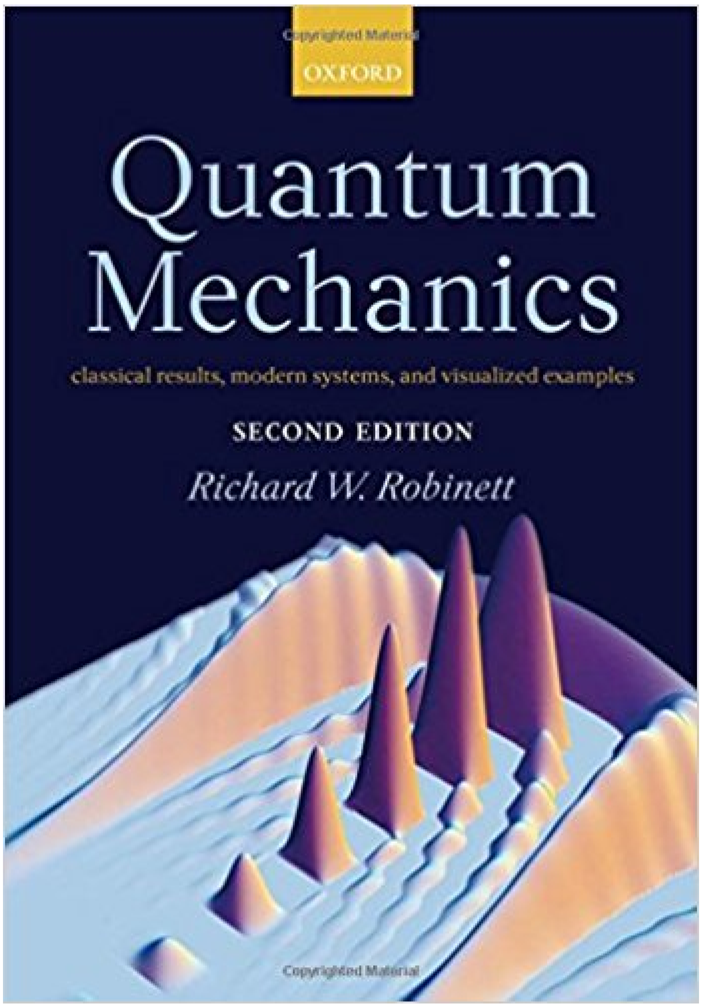
Quantum Mechanics: Classical Results, Modern Systems, And Visualized Examples



Synopsis

Quantum Mechanics: Classical Results, Modern Systems, and Visualized Examples is a comprehensive introduction to non-relativistic quantum mechanics for advanced undergraduate students in physics and related fields. It provides students with a strong conceptual background in the most important theoretical aspects of quantum mechanics, extensive experience with the mathematical tools required to solve problems, the opportunity to use quantum ideas to confront modern experimental realizations of quantum systems, and numerous visualizations of quantum concepts and phenomena. Changes from the First Edition include many new discussions of modern quantum systems (such as Bose-Einstein condensates, the quantum Hall effect, and wave packet revivals) all in the context of familiar textbook level examples. The book continues to emphasize the many connections to classical mechanics and wave physics to help students use their existing intuition to better learn new quantum concepts.

Book Information

Hardcover: 720 pages

Publisher: Oxford University Press; 2 edition (June 22, 2006)

Language: English

ISBN-10: 0198530978

ISBN-13: 978-0198530978

Product Dimensions: 9.8 x 1.5 x 6.6 inches

Shipping Weight: 3.5 pounds (View shipping rates and policies)

Average Customer Review: 4.0 out of 5 stars 8 customer reviews

Best Sellers Rank: #1,153,032 in Books (See Top 100 in Books) #57 inÂ Books > Science & Math > Chemistry > Physical & Theoretical > Quantum Chemistry #139 inÂ Books > Science & Math > Physics > Nuclear Physics > Atomic & Nuclear Physics #763 inÂ Books > Science & Math > Physics > Mechanics

Customer Reviews

Reviews of the First Edition"Richard Robinett has used his extenisve experience in teaching undergraduate quatum mechanics to write an outstanding textbook with a distinctive flavor....he does a masterful job in all these areas....the book is well organized....the heavy stress on visualization is to be commended....questions and problems of very high quality....Robinett has an elegant conversational style of writing which is succint and easy to read. The result is a well-written innovative book which stands apart from other undergraduate quantum mechanics texts."--Uday

Sukhatm, University of Illinois at Chicago, Foundations of Physics"Throughout, [Robinett] makes extensive use of comparison between the quantum and classical probability distributions. These enriching additions are overlaid on an excellently written, comprehensive treatment of quantum physics fundamentals....Each chapter ends with an especially rich and novel selection of problems at varying levels of difficulty....I definitely would choose Robinett's book as a main textbook, and I highly recommend it for Physics libraries."--Suzanne Amador, Haverford College, Physics Today"I would strongly recommend the book for consideration as a text"--R.D. Murphy, University of Missouri-Kansas City, American Journal of Physics"....its wide range of subjects, assortment of applications and problems, and visual environment make it a valuable resource in the teaching and learning or quantum mechanics."--C. Michael McCallum, University of the Pacific, Journal of Chemical Education"Robinett offers not only a comprehensive introduction to the subject for undergraduates, but also an impressive array of visualizations and diagrams, to instill readers with a true feel for the science."--Books Online

Richard W. Robinett Professor of Physics, Penn State UniversityUniversity Park, PA 16802USA Undergraduate majors in Mathematics and Physics (Magna cum laude)from the University of Minnesota 1975Ph. D. (elementary particle theory, grand unified theories) fromUniversity of Minnesota, 1981Postdoctoral research positions at University of Wisconsin, Madison(1981-1983) and University of Massachusetts, Amherst (1803-1986)Assistant, Associate, and then Full Professor in the Department ofPhysics, Penn State UniversityAssistant/Associate Department Head, Physics Department, Penn State University, 1999 - present Elected Fellow of the American Physical Society (Forum on Education) 2003Robinett, Richard WPenn State UniversityCitation: For his contributions to undergraduate education in quantum mechanics, especially in visualization, and for demonstrated excellence in the training and advising of undergraduate physics majors.Nominated by: Forum on Education

This book teaches you a lot of important things that aren't typically covered in an UG book, but it does so a bit too tersely. I used this in my UG QM1 course and hated it. The author throws pages and pages and pages of calculus and algebra at you and you get lost and forget that you were doing quantum mechanics. You sit there trying to evaluate 12 different integrals and do 6 terms divided by 9 terms of algebra and the course felt like "advanced techniques in college algebra" instead of "introductory QM." The gaussian wavepacket problems are exemplary of this.Coming back as an individual now studying QFT/GR and higher, this book is much easier and I'm noticing some things that are insightful, but not digestable due to the pages of work. I completely missed the point of section 14.2 on seperable systems with multiple particles my first time around. It was just too many terms for my puny UG brain to understand. However, once you learn it with the dirac braket formalism, it’s as simple as can be. Why would one try to explain the concept of a separable wavefunction with N 3 dimensional integrals of a N particle wave function? Does = not explain this perfectly in a 95% less cumbersome notation? Especially since this is post the "formalism" chapter. Maybe I’m just brainwashed by Sakurai’s beautiful use of bras and kets.

The first edition, here reviewed, has been superseded by later editions (which I do not own).However, this text remains a favorite reference. It is different enough in conception, execution andpedagogy to warrant perusal by well-prepared undergraduates. The text: twenty chapters & seven appendices.How to review this informative textbook ? Best to start with the exceptional student Problems, which,themselves, are preceded by Questions asking for qualitative discussion.(1) P1.6 ....reviews Scaling Laws ("....re-derive all the results of example 1.1 for general power law...")and, also, experience acquired with classical action and quantum trajectories (P.1.12, parts a,b,c).(2) P2.1.... already we are factorizing a wave equation. And, P2.9 a useful summation formula and its derivation.(3) P3.9.....Klein-Gordon equation in three dimensions ---a six-part problem, hints provided !(4) P4.5.....Photons and Boltzmann Distribution, five-part problem, with hints, again !(5) Hermitian Operators are explored in some of these problems (P5.11 to 5.14) and Airy Differential Equation explored (5.21).(6) "A classical particle rattling around in a one-dimensional box would exert a force on the walls, the same is true in quantummechanics. To evaluate it consider a particle in the ground-state of the standard well...." Last problem chapter six.(7) Chapter 18: "...this exercise shows that there is actually a kind of four-dimensional symmetry to the inverse-squarelaw problem, giving it its enhanced symmetries." (Page 438).(8) Casimir Effect in a Conducting Cavity, Problem#19.32, ends thus :" the exploration of the quantum world in manydiverse areas of research is ongoing, and many interesting questions remain to be answered..."Those are merely some of the fascinating Exercises for the student to ruminate upon, as detailed in this text. Many more await.Now, we look at the content proper.That is,does it repeat what is to be found in every other undergraduate textbook ?Answer: Of course, not. Chapter One, a beautiful exposition of Dimensional Analysis and a dose of Action Principles.Next, a brief review of classical waves, dispersion, and a look forward to tunneling. The detail regarding Gaussian Wave-Packetsis a nice portion of chapter three, a review of probability offered next. Fifth, Schrodinger Equation, which ends with Commutators.More than you may want to know about The

Infinite-Well is presented twice:Once over conceptually, then, formally.We meet a fine, brief, introduction to Propagators (Green's Functions) as conclusion to these two (detailed) chapters; segue tothe next on Many Particles in the infinite-well (Applications abound: electrons in metal, nuclei, neutron stars and white dwarfs).It is here that we meet the Pauli Exclusion Principle: "In this case, Planck's constant has predicted the dimensional factorscorrectly, but the exclusion principle can still play just as important a role in determining the actual state of the physical system."The Harmonic Oscillator is primarily approached via traditional differential equation's power-series solution.Its connections toclassical physics kept in mind throughout.(Pages 202-206). Approximations, next. A nice discussion of numerics, Monte-Carlo,and Rayleigh-Ritz culminate in excellent reviews of matrices with their connection to time-independent perturbation theory.We arrive at one-dimensional scattering, followed by lengthier formal aspects of operators (thirteenth chapter) and another doseof Harmonic Oscillators via factorization methods (here, an excellent fourteenth chapter--we are introduced to Supersymmetry !).The Second Part of the Text (Chapters Sixteen to Twenty)"..where the emphasis switches to more physical systems" (preface),step up to two and three dimensions. I single out two highlights--my personal favorites:(1) Hydrogenic systems.... touches on Rydberg atoms plus Muonic, Pionic,Positronium and Quarkonia.(2) Gravity and Electromagnetism.... touches on Effects of Stark, Zeeman , Ahoronov-Bohm, and Casimir.These enriching chapters (18 &19) provide a wealth of detail, at a level accessible to most undergraduates.The Appendices span the gamut: Complex Numbers,Integrals, Series and Sums,Special Functions, Dirac-Delta,and much more, besides (a brief review of Hamiltonian mechanics). My advice: Look at the appendices beforetackling the textbook. If all appears pleasingly familiar; then, the contents of the text should be accessible.Robinett has provided a most enriching textbook. It might not appeal to all, as it is a bit more challenging than themore popular undergraduate textbooks (say, the excellent text of Griffiths--his, with slightly different emphasis).More by Robinett in: American Journal of Physics (Volume 70,Number 3, March 2002) and Physics Reports (3 March 2014).This text can serve dual purpose: introductory courses and advanced reference.It is great for an alternative exposition and springboard to advanced material.

Robinett's book is a comprehensive is somewhat mathematical treatment of the fundamental aspects of this fascinating subject.Among the things most pleasing about the book are:1. A constant connection with classical physics principles;2. An early introduction to and development of the wave packet and operators and a physical interpretation of Schrodinger's equation;3. A comprehensive discussion of various QM models in both their mathematical and physical aspects: the infinite well and other 1-D potentials, SHO, scattering;4. Two-D and Three-D QM and the development of the Hydrogen atom;5. Development of Gravity and QM;6. An abundance of examples, many based on experimental results for the student to try out.The mathematics is clear, and unlike many other books, the author takes the trouble to present many of the intermediate steps. I should say, however, that there are quite a few TYPOS sprinkled throughout the text. They are only a minor distraction and if anything, finding and fixing them can be a useful learning experience! My criticsm would be that the sections on the physical and mathematical development of Spin is too short. Indeed, the Stern-Gerlach and associated gedanken experiments which are so fundamental to an understanding of the postulates of QM do not get much of a mention.Having said this, the book is certainly a good introduction to the subject. It complements other traditional texts like French and Taylor quite well.

I have been much impressed by Robinett's introduction to quantum mechanics. He seriously attempts to teach the principles of the subject, and does so with considerable effect. His quasi-derivation of the Schroedinger equation is notable.I have used this twice in introductory quantum mechanics courses. Some students were vocal in their dislike of the book. However they seemed to have learned quite a bit from it. Given the adverse comments to be found about all other books in physics on the negative comments inspire contempt rather than respect. If Robinett errs, it is in attempting to teach Qm rather than in pounding formulae into students.

you won't go wrong for the price best money spent Brilliant device! Very rare authentic, since online shopping the most satisfactory Performance of the product is very good, very fast, I have been using it and would recommend it to more friends around. quality is good.

Information Dynamics and Open Systems: Classical and Quantum Approach (Fundamental Theories of Physics) A Modern Approach to Classical Repertoire - Part 1: Guitar Technique (Modern Approach to Classical Guitar) Recent Advances in the Theory of Chemical and Physical Systems: Proceedings of the 9th European Workshop on Quantum Systems in Chemistry and Physics ... in Theoretical Chemistry and Physics) The Light Fantastic: A Modern Introduction to Classical and Quantum Optics Examples & Explanations: Constitutional Law: National Power and Federalism (Examples & Explanations) Corporate Taxation: Examples And Explanations (Examples & Explanations) Examples & Explanations for Bankruptcy and Debtor Creditor (Examples & Explanations Series) Examples & Explanations: Legal Writing, Second Edition (Examples and Explanations) Examples and Explanations: Remedies, 2nd Edition (Examples & Explanations) Examples & Explanations for Antitrust (Examples & Explanations Series) Examples & Explanations for Secured Transactions (Examples & Explanations Series)