Quantum Mechanics I: The Fundamentals

By S. Rajasekar, R. Velusamy

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Quantum Mechanics I: The Fundamentals provides a graduate-level account of the behavior of matter and energy at the molecular, atomic, nuclear, and sub-nuclear levels. It covers basic concepts, mathematical formalism, and applications to physically important systems.

The text addresses many topics not typically found in books at this level, including:

- Bound state solutions of quantum pendulum
- Pöschl–Teller potential
- Solutions of classical counterpart of quantum mechanical systems
- A criterion for bound state
- Scattering from a locally periodic potential and reflection-less potential
- Modified Heisenberg relation
- Wave packet revival and its dynamics
- Hydrogen atom in *D*-dimension
- Alternate perturbation theories
- An asymptotic method for slowly varying potentials
- Klein paradox, Einstein-Podolsky-Rosen (EPR) paradox, and Bell's theorem
- Numerical methods for quantum systems

A collection of problems at the end of each chapter develops students' understanding of both basic concepts and the application of theory to various physically important systems. This book, along with the authors' follow-up *Quantum Mechanics II: Advanced Topics*, provides students with a broad, up-to-date introduction to quantum mechanics.

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Review

"The first volume of this course of quantum mechanics contains basic concepts of quantum mechanics, mathematical formalism, and a wide range of applications to physically important systems. The problems concerning the considered subject are included at the end of each chapter. The textbook is intended for graduate students and also as a reference book. Doubtless advantage of this tutorial is the discussion of such mysteries in quantum mechanics as the collapse of the wave function, Einstein-Podolsky-Rosen paradox, hidden variables, the paradox of Schrödinger cat, and Bell's theorem. It should be noted the presence of numerical methods in quantum mechanics."
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?Dr. Jonathan P. Dowling, Hearne Professor of Theoretical Physics and Co-Director, Hearne Institute for Theoretical Physics, Louisiana State University, and Author of *Schrödinger's Killer App: Race to Build the World's First Quantum Computer*

"Be assured … these two books by Rajasekar and Velusamy will definitely tell you how to do quantum mechanics."
?Dr. K.P.N. Murthy, Professor, School of Physics, and Director, Centre for Integrated Studies, University of Hyderabad

About the Author

S. Rajasekar received his B.Sc. and M.Sc. in physics both from the St. Joseph’s College, Tiruchirapalli. In 1987, he received his M.Phil. in physics from Bharathidasan University, Tiruchirapalli. He was awarded a Ph.D. in physics (nonlinear dynamics) from Bharathidasan University in 1992. In 2005, he became a professor at the School of Physics, Bharathidasan University. His recent research focuses on nonlinear dynamics with a special emphasis on nonlinear resonances. He has coauthored a book, and authored or coauthored more than 80 research papers in nonlinear dynamics.

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