
Zbl 1156.81004

Takhtajan, Leon A.

Quantum mechanics for mathematicians. (English)

Graduate Studies in Mathematics 95. Providence, RI: American Mathematical Society (AMS). xv, 387 p. $ 69.00 (2008). ISBN 978-0-8218-4630-8/hbk

The book is meant to introduce concepts and methods of quantum mechanics to an audience of mathematicians or graduate students in mathematics. The main emphasis is accordingly on a mathematically rigorous presentation of the subject, including the demonstration of the relevant theorems, including the celebrated Stone-von Neumann theorem. Important physical examples are considered, even if for all the basic experimental facts the reader has to rely on some physics textbooks. It is conceived as a textbook on quantum mechanics for mathematicians, actually one of the very few (see also [*F. Strocchi*, An introduction to the mathematical structure of quantum mechanics. A short course for mathematicans. Advanced Series in Mathematical Physics 28. Hackensack, NJ: World Scientific. (2009; Zbl 1155.81004)] and [*S. J. Gustafson, I. M. Sigal*, Mathematical concepts of quantum mechanics. Universitext. (Berlin): Springer. (2003; Zbl 1033.81004)]). The book is divided in two main parts. Part 1. Foundations introduces quantum mechanics in four chapters: Classical Mechanics; Basic Principles of Quantum Mechanics; Schrödinger Equation; Spin and Identical Particles. Part 2. Functional Methods and Supersymmetry includes more advance topics divided in four chapters according to: Path Integral Formulation of Quantum Mechanics; Integration in Functional Spaces; Fermion Systems; Supersymmetry. In each chapter various problems are suggested, as well as examples and useful remarks. A Notes and References section at the end of each chapter gives an overview of the topics dealt with, referring the reader to relevant monographs or research articles. Attention is devoted in particular to the Weyl formalism, the path integral formulation, integration in functional spaces and group theoretical aspects. The book is very well written, in a tight logical style, relying on the introduction of basic definitions and theorems together with examples. It can be of great interest also for physicists interested in the mathematical foundations of quantum mechanics, as well as mathematical methods for the treatment of specific topics. In particular it clarifies the necessary rigorous background for the formulation of key results in quantum theory.

Bassano Vacchini (Milano)

Keywords : Feynman path integral; functional methods; supersymmetry; Grassmann variables; Feynman-Kac formula; Wiener integral

Classification :

∗81-01 Textbooks (quantum theory)
47N50 Appl. of operator theory in quantum physics
81Q60 Supersymmetric quantum mechanics
70H05 Hamilton's equations