
Preface

This book is intended for a course on nonrelativistic quantum mechanics for physics students: it is the English version (due to my friend and colleague Emilio d’Emilio) of a book based on the lectures I gave to the students of the University of Pisa. The encouraging and long-lasting acceptance of the Italian version led d’Emilio to consider the opportunity of the English version. He eventually convinced me to undertake the task.

In the present version there are a few additions with respect to the original Italian edition: for instance, a chapter introductive to the theory of collisions and a section on Bell’s inequalities. It certainly covers more than the program of a two-term course, thus giving the lecturer some possibility of choice.

Although oversized for a two-term course, the book skips some important topics: for instance, the WKB approximation and the Stern–Gerlach experiment. The last subject is presented in the form of a problem in the book written with E. d’Emilio: “Problems in Quantum Mechanics (with solutions)” (Springer 2011) that is to be considered as a complementary tool for the learning of the subject: for quantum mechanics (much as for many other subjects, but maybe a little more) a step-by-step painstaking verification of the understanding of the new ideas is advisable and, for this purpose, problem solving is – in my opinion – a particularly effective mean.

There are many excellent books more complete than the present one and I do not intend to compete with those: when first writing this book (the Italian version) the objective I had in mind was to help students in their first approach to this beautiful, although not easy, subject: I did not underestimate the difficulties a student may encounter, after two years profitably spent learning classical physics, in accepting that a particle (a photon, a neutron, an electron ...) does not follow a well definite path but two, or even more, at the same time (the which-way problem).

For this reason, after a reasonable space dedicated to the issues that determined the crisis of classical physics and the Einstein–Bohr–de Broglie ideas that were seminal for the birth of quantum mechanics, the principles of quantum mechanics are presented in an inductive way through real experiments

(as those of neutron interferometry), and their abstract formulation is given a ‘psychological preparation’. After that, the student is taken step by step from the very birth of quantum mechanics to the more affordable applications of the theory, to end up with the still alive and more intriguing aspects connected with the paradoxes of quantum mechanics and a mention to the Bell inequalities and Aspect’s experiments.

The collaboration of Emilio d’Emilio I took advantage of in writing this book must be acknowledged: not only he translated the Italian version, but from the very beginning of my task he assisted me day after day with advices and suggestions, outcome of his everyday experience with students undertaking the study of this subject. It is an understatement to assert that this book would had never been written without his collaboration.

Neither would had been written if, long time ago, I did not benefit of such great masters as Franco Bassani, Elio Fabri and Luigi A. Radicati.

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A Two-Term Course

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