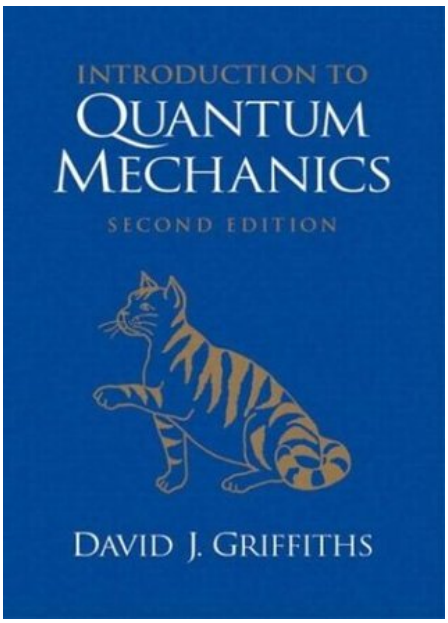

Introduction to Quantum Mechanics

David J. Griffiths

Introduction to Quantum Mechanics

David J. Griffiths

Introduction to Quantum Mechanics David J. Griffiths
This book first teaches learners how to "do" quantum mechanics, and then provides them with a more insightful discussion of what it "means." Fundamental principles are covered, quantum theory presented, and special techniques developed for attacking realistic problems. The book s two-part coverage organizes topics under basic theory, and assembles an arsenal of approximation schemes with illustrative applications. For physicists and engineers. "

Introduction to Quantum Mechanics Details

Date	:	Published March 1st 2004 by Pearson (first published 1994)
ISBN	:	9780131118928
Author	:	David J. Griffiths
Format	:	Hardcover 468 pages
Genre	:	Science, Physics, Textbooks, Nonfiction, Reference, Quantum Mechanics, Academic, Mathematics, Unfinished, School

From Reader Review Introduction to Quantum Mechanics for online ebook

Bojan Tunguz says

Quantum Mechanics has a reputation for being one of the most esoteric topics in all of Physics. This reputation is largely well deserved, and it has it source in two aspects of Quantum Mechanics that make it particularly hard to understand. Conceptually, Quantum Mechanics puts to test some of our most deeply engrained intuitions about the Physical world. Such notions as the reality of the world apart from our attempts to observe it, causality of events, ability to measure all of relevant quantities at the same time, and localization of physical object are all put to the extreme test. On the other hand the mathematical machinery and sophistication that is required for understanding even some of the simplest quantum mechanical systems is rather daunting. Quantum Mechanics is usually one of the last undergraduate classes that Physics majors take, usually in their junior or senior year, after they have acquired a certain level of mathematical maturity and sophistication. There is a school of thought that posits that the conceptual subtlety of Quantum Mechanics can only be appreciated once the mathematical background is fully mastered. I happen to subscribe to that school of thought, and in my opinion Griffiths' textbook is the surest and the most straightforward path to acquiring the requisite knowledge and mathematical skills for the fullest understanding of Quantum Mechanics. This should definitely not be the first exposure that one gets of the Quantum Mechanics, but those students who are already familiar with some basic problems and results can benefit greatly from this textbook. In fact, in my opinion this is the best overall science textbook. The writing is clear and to the point, chapters and sections are self-contained and build on previous material in the book, there are plenty of worked-out examples, and the problems at the ends of the sections and chapters are designed to put the concepts and the material to its proper use. All of the problems are well-formulated, and there is hardly any ambiguous wording anywhere. Some of the problems are extremely difficult, and can take many, many hours to work out. Those should be attempted only by students who feel very comfortable with long calculus calculations.

When I was an undergraduate this textbook was assigned as an optional/supplementary reading material. Most of us ended up using it more than the official textbook for the class or the professor's notes. I also relied a lot on this textbook for the concise and clear explanation of certain points when I was taking a graduate level Quantum Mechanics. Now that I am actually teaching this course I have used it as the primary textbook for my class and have been extremely satisfied with the decision.

No textbook, of course, is perfect and there are a few things that I would have liked changed about this one as well. It would be useful to have a list of important equations at the end of each chapter, with the explanation of what they are used for. Even though I appreciate its abstract and mathematical approach, many students would benefit from having more of real-world problems and explanations early on. It takes almost all of the semester to get to the first physical system that has any real-world relevance. But other than these problems, I think this is a truly remarkable and great textbook, and it's likely to remain the paragon of good Physics textbooks for at least a few more decades.

João Melo says

All in all this is quite a good book about quantum mechanics for begginers. Everything that is covered is very well explained, and the examples all well chosen, and is organisation is logically consistent throughout

the book. However, I feel that it is often incomplete, lacking further development into most topics covered, namely I wouldn't feel entirely capable of doing a physics exam with only this book as a guide, because it lacks some of the more direct applications of what he is developing. Where his method excels is in the last chapter, that one is pure gold.

Ryan Pennell says

This book is incomplete….but that is the point. The title promises exactly what the book is in every way. If you have an good understanding of Quantum Mechanics, then this book is not for you. If you have an understanding of ordinary differential equations, a willingness to learn some partial differential equations (similar to Griffiths E&M),a working knowledge of E&M and an interest in quantum mechanics beyond a pop-sci book then this book might be perfect for you.

Griffiths is able to take those pre-reqs and guide you along enough where you will be able to not only see the incompleteness of classical mechanics and E&M but of his own book in only four chapters (which is all I suggest from this book, is the first four). Now that is what I call a good teacher. He is able to derive ¾ of what describes a particle, {n,l,m}, in this style. In this derivation we find out ourselves that it is incomplete and does not fully describe the particle and there is additional angular momentum that cannot be described through Diff. Eqs.. With what acts like the rotation of the earth but not really because it can only take certain values, called Spin. It turns out that this, Spin, is the most intrinsic quantity in quantum itself. Which leaves the subject perfectly teed up for Sakurai to more fully explain.

Modern QM is written in terms of bra-ket formulation to more fully describe the subject. However, in my opinion, the average student is not ready for it and needs to be weaned of the classical world rather than pushed into the ocean and told to swim. Also, books that start with spin and use bra-kets often reference solutions to derivations in this book when describing wave mechanics without deriving it themselves. This is really an argument of education and not QM because the bra-ket method wins for actual physics. I am just not sure it is the best place to start when you first learn the subject.

Sasha says

Marry me, professor Griffiths

Laurel says

Yeah, that's right. Five stars for the physics text book. That's how big a dork I am.

---

dead letter office says

if you must be introduced to quantum mechanics, griffiths is your guy. worlds above any other book i've seen as an intro.

Bibi Francis says

Excellent book for beginners

Sean McLaughlin says

Good, but some of the concepts don't carry over as well to more advanced courses later.

Sanjay Gautam says

In my university it was the prescribed textbook. And, to be honest, it failed to make any impact. Although it was good in some aspects, it was insanely bad in many.

Good:
1. It does not require the mastery of advanced mathematics which makes this book suitable for beginners.
2. Its tone is informal and makes it readable.

Insanely bad:
1. Puts out the bra-ket algebra in the beginning but never uses beyond it.
2. He has given most of the necessary derivations as exercises, which makes it unsuitable for beginners.
3. Seems very erratic, irrational, and sometimes illogical in its approach. I never found it to be trustworthy.

Though I've read it from cover to cover, I consider it as 'abandoned'! This book seems to be pretty good to many people but I found it otherwise. It never added anything but very little to my understanding. I would rather recommend QUANTUM MECHANICS: THEORY AND APPLICATIONS and Priciples of Quantum Mechanics, if someone wants to learn QM from scratch.

Robert Schinaia says

I used this textbook when I was taking quantum mechanics classes years ago, and it is the best textbook I have ever read. This book differs from most other quantum mechanics textbooks in that it ignores the historical development of quantum mechanics, and jumps straight into the mathematical formalism (the reader is faced with the time-dependent Schrodinger equation on the very first page!). In the first five chapters of the book, Griffiths explains the basic concepts of quantum mechanics. Chapter 2 was particularly interesting to me because it explains how to use the time-independent Schrodinger equation (in one dimension) for various potentials - e.g. "infinite square well" and "harmonic oscillator" (introducing ladder operators which are used in quantum field theory). The treatment of quantum tunnelling (using the Delta-function potential) is beautiful. Chapters 4 and 5 apply the Schrodinger equation to three dimensions and in spherical coordinates, and then introduces the hydrogen atom, angular momentum, spin, two-particle systems, and quantum statistical mechanics.

The second part of the book (chapters 6 to 12) deals with the applications of quantum mechanics. I particularly loved the sections on perturbation theory (time dependent and time independent), and the Variational Principle.

Although there is a lot of mathematics in this book (quantum mechanics is a mathematical subject), Griffiths does not give complete derivations for everything. For example: he simply presents the Laplacian in spherical coordinates and refers the reader to (Boas 1983) for a complete derivation. Similarly, Griffiths simply introduces, without explanation, the associated Legendre polynomial when deriving the solution to the angular equation in chapter 4.1. But I didn't find this to be a problem; quantum mechanics is complicated enough without the burden of having to derive every detail.

However, to get the most out of this book, it is essential that the reader works through as many problems as possible (a solutions manual is freely available on the internet). You might think that you have understood a particular concept but, without consolidation through practice in problem-solving, this understanding can slip away. Working through the problems requires a lot of work and time, and this is the only way to learn difficult concepts.

I still use this textbook as a reference in my professional life.

In summary: an excellent book that requires a lot of work.

????? says

I've always wanted to explore the world of quantum mechanics, so last semester I decided to take an introductory course, and I'm very glad I did. I'm still a long way from having a solid grasp on this weird and unintuitive subject, but, thanks to this textbook (and my awesome professor), I'm much more confident dealing with quantum phenomena now.

Burak says

I understand the criticism of some readers towards the book, but I have looked at the alternatives offered and they did not do it for me at this stage. This book is a "sweet spot" for me on the entire spectrum of books on the field. It is a great (sweet) first reading for many people like me, who have good technical and mathematical background (say, due to having an advanced degree in a different field), and are curious about Quantum Mechanics. Then a "layman" introduction doesn't do it (been there and done that), and a deeper encounter with the field is possible. Yet, a more technically-oriented introduction can be too mind-bending. So, there is your (my) sweet spot. I believe this makes it a good introduction at the technical UG level as well. Great textbook [but note that I haven't finished it yet :)].

Alexander Temerev says

What an excellent textbook. It is accessible, but still strict enough; it gives you the understanding of the “mystery” of wavefunction collapse, and outlines the way out of it. It is impossible to learn QM with only one text book, but this one is great nonetheless.

Marinda Misra says

We had this book for our quantum physics class in college, and it changed my life! Not in any significant moralistic way, but it showed me that you CAN write a good, readable, helpful textbook on a subject that is extremely hard to understand. When he came to our college as a guest speaker the undergrad physics and astronomy club hosted a pizza lunch for him in the undergrad lounge, and then we asked him if he could sign our textbooks. He was kind of shocked and asked if we would like a reading too. It is literally one of my treasures from my collage days that I will always keep. Plus the cover is hilarious!

Tom says

Update (05/15/16): tl;dr: I would give this book more stars if it is titled "Introduction to Wave Mechanics."

First, the good: this book doesn't require mastery of "advanced" classical physics and math such as Lagrangian and Hamiltonian mechanics, electromagnetism, partial differential equations, linear algebra, or statistics. For example, Griffiths takes his time to explain standard deviations, separation of variables, and phase and group velocity in the beginning. This makes the book very accessible.

The bad: While a step by step calculation makes it easy to follow, one often gets lost in details and misses the big picture. This is not helped by the fact that the book shies away from the math of QM: linear algebra and the concise Dirac notation, which is introduced but quickly discarded.

The author takes the shut-up-and-calculate approach to the extreme (like how standard freshman physics textbooks present QM). The formalism is not developed logically, and, overall, the book is very weak in formalism. For example, the Schrödinger equation specialized to the position space is given from the get-go with the motivation that it is the quantum equivalence of Newton's equation of motion, which is true, but not really helpful; a child may be familiar with the notion of forces, but not Hamiltonians and complex amplitudes. The many subtleties of postulates are never spelled out. (Compare this to e.g. chapter 4 of Shankar's Principles of Quantum Mechanics (Hardcover))

An important fact that quantum states (and not wave functions) and operators in Hilbert space are geometric objects that do not depend on a particular representation is not emphasized enough; when discussing finite-dimensional systems, Griffiths never demonstrates a change of (orthonormal) basis. Symmetry and change-of-basis transformations only make a brief appearance as 2 and 3-star end-chapter problems (which, according to the author's rating scheme, are difficult or peripheral problems) and even there he still doesn't tell you that they are unitary matrices!

The use of the word spinors interchangeably with two-element column matrices does not help in the slightest. Two-element column matrices are two-element column matrices. Spinors are related to

representations of rotation groups, to which Griffiths makes no connection.

He also makes degenerate perturbation theory looks complicate, whereas in fact it is just diagonalizing the degenerated submatrix.

In conclusion, it seems that everything involving matrices is so badly treated that this book should be called Introduction to Wave Mechanics.

I used this book for an undergraduate course taught by an excellent professor. (He made up all the problem sets. So I can't judge the quality of problems in Griffiths.) And I had learned Dirac notation by myself beforehand (from Sakurai's Modern Quantum Mechanics). I can recommend it to an absolute beginner, but with the caveat that this cannot be your last QM book if you want to understand QM. Griffiths prepares you in wave mechanics for e.g. spectroscopy and scattering calculations, but for the foundations of QM, look elsewhere. (A very nice second book explicitly aiming to clear up the conceptual understanding of those who just finish this kind of "wave mechanics" course is Isham's Lectures on Quantum Theory: Mathematical and Structural Foundations.)

For alternatives, I recommend Schumacher and Westmoreland's Quantum Processes, Systems, and Information for modern concepts and Zettili's Quantum Mechanics: Concepts and Applications for worked problems. Shankar and Sakurai mentioned in this review are also excellent.
