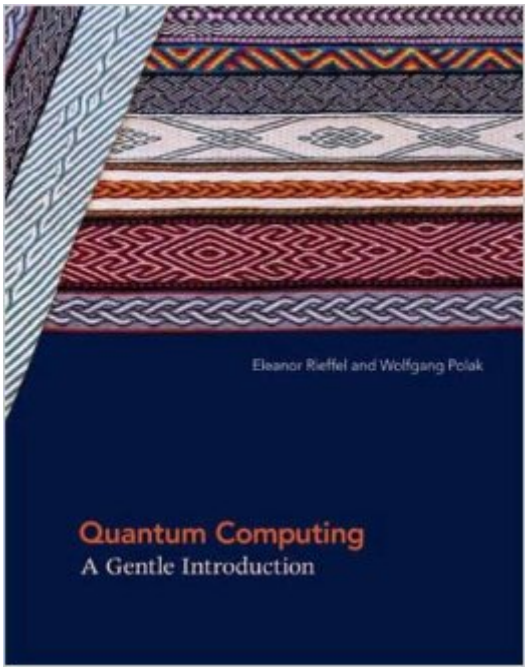
Quantum Computing: A Gentle Introduction (Scientific And Engineering Computation)



Synopsis

The combination of two of the twentieth century's most influential and revolutionary scientific theories, information theory and quantum mechanics, gave rise to a radically new view of computing and information. Quantum information processing explores the implications of using quantum mechanics instead of classical mechanics to model information and its processing. Quantum computing is not about changing the physical substrate on which computation is done from classical to quantum but about changing the notion of computation itself, at the most basic level. The fundamental unit of computation is no longer the bit but the quantum bit or qubit. This comprehensive introduction to the field offers a thorough exposition of quantum computing and the underlying concepts of quantum physics, explaining all the relevant mathematics and offering numerous examples. With its careful development of concepts and thorough explanations, the book makes quantum computing accessible to students and professionals in mathematics, computer science, and engineering. A reader with no prior knowledge of quantum physics (but with sufficient knowledge of linear algebra) will be able to gain a fluent understanding by working through the book.

Book Information

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Customer Reviews

I wouldn't call this a 'gentle' introduction but I guess that would be relative. The material is presented fairly straight forward and cuts out a lot of unnecessary math. Don't misunderstand, you'll have to have some concepts of Linear Algebra to make it through the book. These are graduate level

concepts so expect graduate level effort to understand these concepts. I purchased this book without adequate preparation in mathematics but I was able to follow the concepts. I'm now gaining the math knowledge needed and I'll go through the book a 2nd time.

This is my first introduction to this subject and I cannot compare it to other books on quantum computers. For a subject this complicated and often counter-intuitive, this book is very readable. It contains enough examples to understand each topic before moving on. There are also a lot of useful warnings about incorrect assumptions that the readers might carry over from vector spaces and linear algebra. The authors seem very in-tune to common misconceptions that the reader might have and they take time to correct them. The authors are not stingy about repeating definitions, facts and expanding notations where it is helpful. Still, don't expect to casually browse through this book unless you already know a lot about the subject. It takes work.

This is a good introduction to quantum computing, modulo a few things. I'm a mathematician, and I often found the calculations and concepts explained in a needlessly complicated way. For example, the definition and derivation of the density operator material was very opaque. A density operator is a positive operator with unit trace, so why not say that before getting into rather complicated calculations to illustrate its connections to the quantum state? The formalism invoked really muddied the waters. The same could be said about the material on measurement, and in a few other places. Otherwise, the book is excellent. The exercises are useful, and explanations are well thought out and written. Recommended.

I don't rank this book highest in my library of Quantum computer books, but it is one of the must reads. It is a must read because Quantum Computation and Informatin Science is still in its infancy and one source cannot help you understand what is going on. Eleanor Rieffel is quite respected in the field. Her book is one you read to get a different perspective or slant on what is quantum computing.But, it is written in a traditional text book front to back approach that requires you to read the whole book before you understand what is going on. I perfer to teach by providing the student or reader with a road-map of what is to come in the first chapter. Then follow up with the necessary details. This is an advance topic and not a freshman/junior topic. This allows the student to decide to drop out if it is over their head during the teaching of the first chapter.Therefore, I challenge the sub-title "A Gentle Introduction" and would suggest instead "An Alternative Introdution" I also challeng some one to write a book that is "A Gentle Introduction" to quantum computers that covers

the basic difference between bits and qubits in a few chapters followed by the four categories of application opportunities (quantum factoring, quantum search, quantum data transportation, and quantum noise). The latter give people insight into where the money will be spent and the JOBS will be.

I used this book as a companion in my 4th year college nanoelectronics class, and it proved quite useful. The material is presented fairly well and has good examples and exercises. On the whole, it is a reliable introduction to the field; however the book has a few obvious shortcomings as a text, and for that I deduct some stars. Specifically,(1) There is almost no discussion, within the text, of actual experimental work. There is a *mountain* of very interesting work in QC, including even commercial applications. I found myself scrambling to breathe some life into this very theoretical text by mentioning experimental examples. There are some helpful footnotes, but...goodness gracious, why not acknowledge where we actually are in the field, right now?(2) As nice as the exercises are, most answers aren't provided! That's going to prevent a lot of teachers from adopting the book. However, the examples are nice and much appreciated.(3) I found the comparisons to classical computing and other alternatives e.g. adiabatic QC rather lacking. That's a shame because QC research is a lot more than simple theoretical two-state manipulations.On the whole, I didn't find this book as "gentle" for my students as I'd hoped! Without my PhD-level understanding of QM, I honestly would not have caught the most important points, myself. My students were completely lost at sea in several sections. That said, there are so few good texts on QC, this did provide a nice theoretical framework.

It's a great intro. You probably only need a solid undergrad background to understand this book, though you do need to have seen the Dirac bra-ket version of quantum mechanics to keep up. Oh, and some linear algebra would help too.

Engineering Calculations (Dover Books on Computer Science) Modern Fortran Explained (Numerical Mathematics and Scientific Computation) Quantum Computation with Topological Codes: From Qubit to Topological Fault-Tolerance (SpringerBriefs in Mathematical Physics) Student Solutions Manual for Differential Equations: Computing and Modeling and Differential Equations and Boundary Value Problems: Computing and Modeling GPU Computing Gems Emerald Edition (Applications of GPU Computing Series) Numerical Techniques for Direct and Large-Eddy Simulations (Chapman & Hall/CRC Numerical Analysis and Scientific Computing Series) Computability, Complexity, and Languages, Second Edition: Fundamentals of Theoretical Computer Science (Computer Science and Scientific Computing) Verification and Validation in Scientific Computing The Theory of Matrices, Second Edition: With Applications (Computer Science and Scientific Computing) Modern Perspectives in Lattice QCD: Quantum Field Theory and High Performance Computing: Lecture Notes of the Les Houches Summer School: Volume 93, August 2009 Elementary Linear Programming with Applications, Second Edition (Computer Science & Scientific Computing Series) Quantum Computing for Computer Scientists Introduction to Computation and Programming Using Python (MIT Press) Introduction to Computation and Programming Using Python: With Application to Understanding Data (MIT Press)