Second Year Quantum Mechanics

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Textbooks

1. **Quantum Physics, 3rd ed.** by Gasiorowicz. My favourite book among the texts at the right level for this course. Good discussions of many topics, including those to be covered in the Further Quantum Physics course. Contains a short introduction to Linear Vector Spaces and Dirac notation (see Maths Methods course). Much more material available free at the Wiley web site for Gasiorowicz. **My primary recommendation for the QM course.**

2. **The Feynman Lectures on Physics, Vol. III** by Feynman. Excellent but idiosyncratic treatment of basic QM starting from discrete systems and only treating the Schroedinger equation near the end. Many exceptionally clear and interesting discussions with, as you'd expect from Feynman great physical insight. Reading this book is highly recommended. **At the very least you should read the first 3 chapters.**

3. **Quantum Mechanics** by Mandl. A very good and careful textbook at a slightly higher level than Gasiorowicz. Not much on the experimental background of QM, but otherwise a strong book covering all the main topics in this course (and those of Further Quantum), with a nice introduction to Dirac notation. **A good alternative to Gasiorowicz.**

4. **Principles of Quantum Mechanics, 2nd ed.** by Shankar. In my opinion the best advanced text on QM (advanced undergraduate and graduate level). Very thoughtful discussion of much of the foundation and basic principles of QM although fewer applications are treated than in some other books. The book assumes a relatively high level of mathematical sophistication, but fits in well with the topics covered in the Maths Methods course (eg, vector spaces, linear operators,...). **Good reference work if you really want to know what's correct.**

5. **The Strange World of Quantum Mechanics** by Styer. A short and mathematically elementary book that nicely introduces some of the basic physics of QM together with a notably careful introduction to the interpretation of QM. **Highly recommended as background reading, especially for those wanting more on the 'philosophy' of QM.**

6. **QED: The Strange Theory of Light and Matter** by Feynman. A masterful semi-popular book which discusses both QM **and quantum field theory** (ie, anti-particles, etc....) without using any equations – just words and pictures. **One of the finest semi-popular science books ever written. Highly recommended.**

7. **An Introduction to Quantum Physics** by French and Taylor. An introduction with rather more explanatory text than most books, but at a simpler level than this course and Gasiorowicz. Extensive discussion of the experiments behind the discovery of QM. Some of you may prefer this more wordy introduction to the elementary aspects of this course.

8. **Quantum Mechanics** by Rae. Has in the past been the standard recommended text for this course. Advantages: it is cheaper than Gasiorowicz, and also has a chapter on the interpretation of QM. Disadvantages: physics discussions not as good or complete as Gasiorowicz, nor are the discussions of interpretations of QM as careful as Styer.

9. **Introduction to Quantum Mechanics** by Dicke and Wittke. A good book at the same level as Gasiorowicz, with many worthwhile problems. Now sadly out of print.

10. **The Principles of Quantum Mechanics** by Dirac. The classic advanced book by one of the founders of QM. Educated many generations of physicists. Assumes a high level of mathematical ability.

11. **Lectures on Quantum Mechanics** by Baym. A very good advanced text on QM discussing many physical systems in a notably 'friendly' way.

12. **Quantum Mechanics (Non-relativistic Theory)** by Landau and Lifshitz. An advanced text by two great Russian physicists which, while a little weak on fundamentals, discusses very many applications in considerable depth. Assumes a high level of mathematical ability.

13. **Inward Bound** by Pais. A classic, serious (with equations) **history** of the development of QM and other aspects of theoretical physics in the 20thC. Shows that the true history of the development of QM is much more interesting and surprising than the potted history one gets fed in undergraduate and graduate QM courses.

14. **Planck's Legacy to Statistical Mechanics** by Parisi (available in PDF format at http://arXiv.org/abs/cond-mat/0101293). A wonderful 10 page paper on aspects of the early historical development of QM – particularly how Planck, Einstein, Bose, etc, brilliantly invented the correct physics even though their arguments were logically/mathematically incorrect! (Not a recommended technique for undergrad exams, but great for a Nobel....) You should be able to fully understand this article after the end of your second year.

Note: Many other books are reviewed in the references section of Gasiorowicz.