Undergraduate Recommendations

Daniele B. Provenzano | daniele.provenzano@sns.it

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Here you can find my recommendations for undergraduate-level textbooks on Classical Physics. Be sure to get the last edition and to check the Errata/Corrige. *Disclaimer:* these are my own recommendations! I do not claim that these are the absolute best, but they were the most suitable for me at the time I wrote these pages. Also, this list might change in future!

1. The foundation of Physics is Mathematics. One of my professors used to say: "A physicist who doesn't master math is a poor physicist". As for **Mathematical Analysis** and **Calculus**, my recommendations are:

   - *Calculus* (4^{th} ed.) by Michael D. Spivak.
   - *Principles of Mathematical Analysis* (3^{rd} ed.) by Walter Rudin.

2. **Classical Mechanics** is the branch of Physics most directly connected to everyday life and, as a result, is the first subject introduced in school and university studies. The books I highly recommend are the following.

   - *Classical Mechanics* by John R. Taylor for the theory.
   - *Introduction to Classical Mechanics* by David J. Morin for the exercises. Apart from the theory, this book contains the best collection of problems on CM. No further explanation is necessary: it is a must-have for every physicist! Go and buy it immediately! If you find it difficult, you can try first its easier version: *Problems and Solutions in Introductory Mechanics*, by the same author.
   - *Physics for Mathematicians - Mechanics I*, by Michael D. Spivak. Are you looking for a book that offers a formal treatment of Classical Mechanics while still being accessible to physicists? This is the perfect book for you! It features many insightful interludes that will deepen your understanding of the subject and it is in my top three textbooks of all time. The same author wrote a second (unfinished) volume on Electromagnetism before he sadly passed away. I have heard that it will be published in the future... I can't wait!

3. When it comes to **Waves and Oscillations**, the best resource is the draft Waves by David J. Morin. It does not include exercises for now, but it still provides a crystal-clear treatment of the subject. You can find some exercises in the book mentioned previously.

4. For **Special Relativity**, I strongly recommend the following introductory textbooks.

   - *Relativity Made Relatively Easy* by Andrew M. Steane, for the theory.
   - *Special Relativity* by David J. Morin, for the exercises. This is an upgraded version of the chapters that he wrote in ICM.

5. Let's talk about **Electromagnetism**. Here, the choices are inevitable.

- *Introduction to Electrodynamics* (5^{th} ed.) by David J. Griffiths.
- *Electricity and Magnetism* (3^{rd} ed.) by E. M. Purcell and D. J. Morin, again ☺.

I would suggest using both textbooks simultaneously. They offer plenty of exercises, but if that is not enough, I strongly recommend using

- *Problems in Classical Electromagnetism*, by A. Macchi, G. Moruzzi and F. Pegoraro. This book contains one of the best collection of problems on EM I know, some of which are quite original. I had the pleasure of attending two courses taught by Professor Macchi, and I can confirm that he is very good at teaching!

6. As for **Thermodynamics**, unfortunately, I don't think there is an equivalent of Morin's or Griffiths' for this subject. The available books are either too theoretical or lack sufficient exercises. However, I recommend:

   - *Concepts in Thermal Physics* (2^{nd} ed.) by S. J. Blundell and K. M. Blundell.
   - *Heat and Thermodynamics* (7^{th} ed.) by M. W. Zemansky and R. H. Dittman.

7. **Fluid Dynamics**

   - *An Introduction to Fluid Dynamics*, by George K. Batchelor.
   - *Fluid Dynamics for Physicists*, by Thomas E. Faber.
   - *Theoretical Fluid Mechanics*, by Richard Fitzpatrick.

8. **Optics**

   - *Optics f2f: From Fourier to Fresnel* by C. S. Adams and I. G. Hughes.
   - *Principles of Optics* (7^{th} ed.) by M. Born and E. Wolf.

If you are looking for a textbook that contains (almost) everything and at a higher level, I recommend *Modern Classical Physics* by Kip S. Thorne and Roger D. Blandford.

My last suggestions are two math books of the same author: *Visual Complex Analysis* and *Visual Differential Geometry* by Tristan Needham. You should definitely own at least the first one, it will make you understand complex analysis with intuitive examples.

As you can see, I have cited five works by David J. Morin in just two pages. This could mean one of two things: either I'm obsessed with him, or he's a master at writing physics textbooks. Read his books and decide for yourself.