

Post-Use Review: Classical Mechanics. John R. Taylor. 580 pp. University Science Books, Sausalito, CA. Price: \$86.50 ISBN 1-891389-22-X. (Gayle Cook, Reviewer.)

I have used a pre-publication edition of this book for two quarters, at Cal Poly (California Polytechnic State University, San Luis Obispo). The courses are called Phys 302 and 303: parts I and II of a junior-level class in Analytical Mechanics.

I find this to be a superb text. The clarity and readability of the book is so much better than anything else on the market, that I confidently predict it will soon be the most widely used book on the subject. I judge it to be at least 10 times better, maybe more, than the other two popular classical mechanics books on the market right now: the book by Fowles, which students say is too terse to understand, and the book by Marion and Thornton, which students say is so wordy and lengthy that they feel quickly lost.

Some of the things I especially like about Taylor's book are the following:

- (1) The chapter on projectile motion (Chapter 2), which includes very clear treatments of linear and quadratic air resistance.
- (2) The introduction to calculus of variations and Lagrangian mechanics very early on (starting in Chapter 6). After all, this is the basis for the whole subject of Particle Physics, Feynman path integrals, and so on.
- (3) The introduction to Hamilton's equations, in Chapter 13. It is the basis for quantum mechanics.
- (4) The chapter on nonlinear systems (Chapter 12), which my students say is sexy: meaning they found it stimulating and modern. (At least, I *think* that is what they mean)
- (5) The chapters are often self-contained. You do not need to follow the order of chapters in the book all the time, but can skip around. In fact I recommend this, as you will see.
- (6) Chapter 11, on coupled oscillations, is very clear and necessary.
- (7) The problems are reasonable. I felt that Taylor sometimes gave too many hints, but my best students told me the exercises at the end of the chapters were still challenging, so I must be wrong.
- (8) The addition of computer based problems is apt right now. Personally I had some trouble with a few students who claimed not to know how to use Maple (my personal favorite), Mathematica, MathCad, MatLab or even Excel. I think we are in a period of transition, as students learn to use these programs more confidently. But the students need to learn these skills, and an introduction in a course such as Classical Mechanics is very appropriate.

I made some mistakes when I tried to teach this course. I would like to share these with the reader.

- (i) I started too slowly. I covered the material in Chaps. 1, 3, 4, and 5 (Newton's laws, conservation laws) in too much detail. My students were bright; they knew about conservation laws, and I insulted them by belaboring these chapters. I now believe Taylor intended them as a review of the introductory course, to be read very quickly. The book is great this way: if the student needs a review, it is there.
- (ii) I paid less attention to the chapter on coupled oscillations (Chap. 11) than I should have. I really like this chapter, and will spend more time with it next time.
- (iii) In the future I will cover Chaps. 1–5 rapidly, with an emphasis on rotational motion (which we do not treat in sufficient depth in the introductory sequence). Then to Lagrangian mechanics, and to Hamilton's equations. These chapters are basic. Then to coupled oscillations, nonlinear systems and beyond.

I have discussed this book with several of my colleagues, and all agree it is a great improvement on anything available until now. My colleagues have come up with some interesting ideas. Most say it is difficult to teach Classical Mechanics, because the students regard the subject as dry. You can tell them it is fundamental to everything else—quantum mechanics, particle physics, and so on—but this means little to them as undergraduates. They will only appreciate the beauty of it, and the correspondence with quantum mechanics, etc., in graduate school.

In summary: I have found Taylor's book to be really fine—much better than anything else on the market for this course. It is clear and readable. I will use it in the future for any analytical mechanics class I teach, unless something truly remarkable turns up.

I would like to thank my colleague Chance Hoellwarth for his insights and suggestions about this book, which he also supports strongly.

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