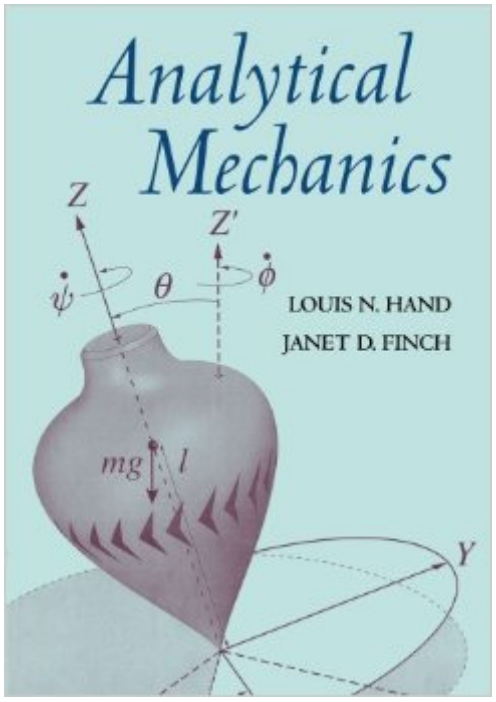
Analytical Mechanics



Synopsis

This introductory undergraduate text provides a detailed introduction to the key analytical techniques of classical mechanics, one of the cornerstones of physics. It deals with all the important subjects encountered in an undergraduate course and thoroughly prepares the reader for further study at graduate level. The authors set out the fundamentals of Lagrangian and Hamiltonian mechanics early in the book and go on to cover such topics as linear oscillators, planetary orbits, rigid-body motion, small vibrations, nonlinear dynamics, chaos, and special relativity. A special feature is the inclusion of many "e-mail questions," which are intended to facilitate dialogue between the student and instructor. It includes many worked examples, and there are 250 homework exercises to help students gain confidence and proficiency in problem-solving. It is an ideal textbook for undergraduate courses in classical mechanics, and provides a sound foundation for graduate study.

Book Information

Paperback: 592 pages

Publisher: Cambridge University Press; 1 edition (November 13, 1998)

Language: English

ISBN-10: 0521575729

ISBN-13: 978-0521575720

Product Dimensions: 7 x 1.2 x 10 inches

Shipping Weight: 2.8 pounds (View shipping rates and policies)

Average Customer Review: 2.9 out of 5 starsÂ Â See all reviewsÂ (17 customer reviews)

Best Sellers Rank: #110,695 in Books (See Top 100 in Books) #51 inÂ Books > Science & Math > Physics > Mechanics #77 inÂ Books > Textbooks > Science & Mathematics > Mechanics #315 inÂ Books > Textbooks > Science & Mathematics > Physics

Customer Reviews

As the authors point out in their preface, this book was developed as part of a classroom course - one where students would have ongoing email discussions with one another and with a teaching assistant throughout the course. As a result, many important ideas are presented in the form of "email questions", which the book leaves unanswered. Students are supposed to think about them on their own, then verify their answers by emailing the TA. Similarly, none of the chapter exercises have any answers, nor is there a student answer guide available.While this is an interesting pedagogical approach, it severely limits the value of this book as a general physics text. In fact,

outside the exact instructor-based class format used by the authors, the book is relatively useless.As alternatives, I'd recommend Fowles & Cassiday (at the easy end of the spectrum), or for the more ambitious, just jump into Goldstein. Either of those volumes, plus a good problem book, will teach you far more physics than Hand & Free.

There are numerous books in Classical Mechanics. However, there appears to be no other book written for undergrads besides this one which contains an almost complete list of topics. For this reason, the present book remains the unchallenged text for an undergrad Classical Mechanics course for those instructors who do not wish to deviate from the established must-be-taught curriculum.Unfortunately, this creates some displeasure among students since the book is plagued by many problems. The typesetting and the graphics are good but everything else is not that good. Not much planning was done and not much effort was placed to convert the initial lecture notes and emails into a coherent and pedagogical manuscript. And the flaws, in my opinion, are not the lack of answers for the problems at the back of the book, nor that the book is really too advanced, nor that the book is too mathematical as has been argued by other reviewers.Instead I take issue with: (1) The writing style is poor. (2) The solved problems and examples are not well presented and their number is not enough to cover all concepts discussed in the book. There is a good fraction of unsolved problems however. (3) The ordering of the material. For example: Chapter 3 on Oscillators could be Chapter 1. Almost no Lagrangian formalism is used. Another example is Sections 5.1 and 5.2. They use only the concept of the Lagrangian. They do not fit in Chapter 5 which is about the Hamiltonian formulation of Mechanics. (4) Not only the material could have been ordered better but, more importantly, the presentation of the topics is fragmented. For example: In Section 1.4 to concept of a constraint is given. There is some discussion on the classification/distinction of constraints but the discussion is stopped and the most important distinction - holonomic vs. nonholonomic - is discussed in Appendix A of Chapter 1. In Chapter 2, instead of presenting the theory of variations and then explain how it is applied to physical problems, the authors open sections with titles such as `2.7 Solving Problems with Explicit Holonomic Constraints' and `2.8 Nonintegrable Nonholonomic Constraints - a method that works'. As a result, great confusion emerges between the mathematical techniques and the concept of constraints. I would have preferred that the same problems (some with and some without constraints) are first solved in Chapter 1 using virtual work and then in Chapter 2 using calculus of variations. (5) There are many important issues that are left as exercises and are not discussed in the text. For example: what is the relation between the energy and the Hamiltonian? (6) There is no section on classical scattering

and cross sections. This is very surprising given that one of the authors is an accelerator physicist. The students learn about the topic in a single problem: Problem 28 of Chapter 4. (This explains why I claimed that the list of topics is almost complete and not complete.)There are several other issues that bother me but hopefully the above list is enough. There is certainly a need for another book on Classical Mechanics that will contain the topics that this book contains but written with care, attention to detail and clarity. Until then, this book will be used by many instructors and you will have to buy it if you are an undergraduate student studying the subject. If you really want to avoid it, try Landau and Lifshitz'sÂ Mechanics, Third Edition: Volume 1 (Course of Theoretical Physics)Â which is an excellent book but it is requiring a higher level of mathematical skill and is missing topics that were developed after the authors' deaths (e.g. chaos) or found in other volumes of the series (e.g. relativity).

This is a fabulous book! It is written at a very advanced level, however, which is why some of the others reviewing this book failed to see its strengths. If you are taking a second course in mechanics, and you are past the stage where you need to have your hand held throughout an entire course, then this book is ideal.

This book is excellent to fill the gap between basic physics (such as: Halliday-Resnick, etc.) and advanced classical mechanics (such as: Goldstein or Arnold).The discussion is clear and expressed in plain English. The problems are both challanging and informative.In my opinion, this text is better than Symon's "MECHANICS"and should be in your shelf right next to Goldstein's.This text can also be used to accompany Marion-Thornton's "CLASSICAL DYNAMICS".

I just spent the past semester taking the course using this book at Purdue University. It was a horrible experience, the explanations in the book are poorly written and poorly constructed. There are no examples in the book, which instead chooses to lecture endlessly on about mathematics in a way that is entirely aphysical, reducing learning from this book to often be the same as taking engineering -- endlessly memorizing equations and how to apply them. I got a B in the class in the end, but only because I used Marion & Thornton's book in parallel.The entire semester, the professor said "I know, this book sucks. Sorry guys." So its not just me. Any professors looking at assigning this book, steer way clear. And a tip for the future: Any book that prints only in paperback can't be that good.

This book lacks good examples, and continuosly alters the time scale to "simplify" equations, which merely makes the form confusing. Classical Mechanics by Goldstein is far superior. Although the problems in Goldstein are much more difficult, the content is more thorough and straightforward. Hand and Finch do an extremely poor job with the Laplace Rung Lenz Vector, and their work on Hamiltonian dynamics is incomplete and largely unmotivated. The only benefit of this book over Goldstein is the introduction of Green's Functions, which Goldstein does not cover.All in all, if you want an undergraduate Analytic Mechanics text, buy Goldstein. Its more advanced, but more comprehensible.

This is a very good book for learning analytical mechanics.As a student, I recieve the Mechanics by Florian Scheck, and I want to tell you that I couldn't understand a word. Mechanics by Florian Scheck is probably a good book but for me, it's not readable. So, I took Analytical Mechanics by Louis N. Hand and Janet Finch, a readable book, that actually tries to explain things in simple, clear words. It's also better than Landau's.I've also enjoyed read from it other chapters that wasn't in my course's scope, something I never thought I'll do... Recommended!