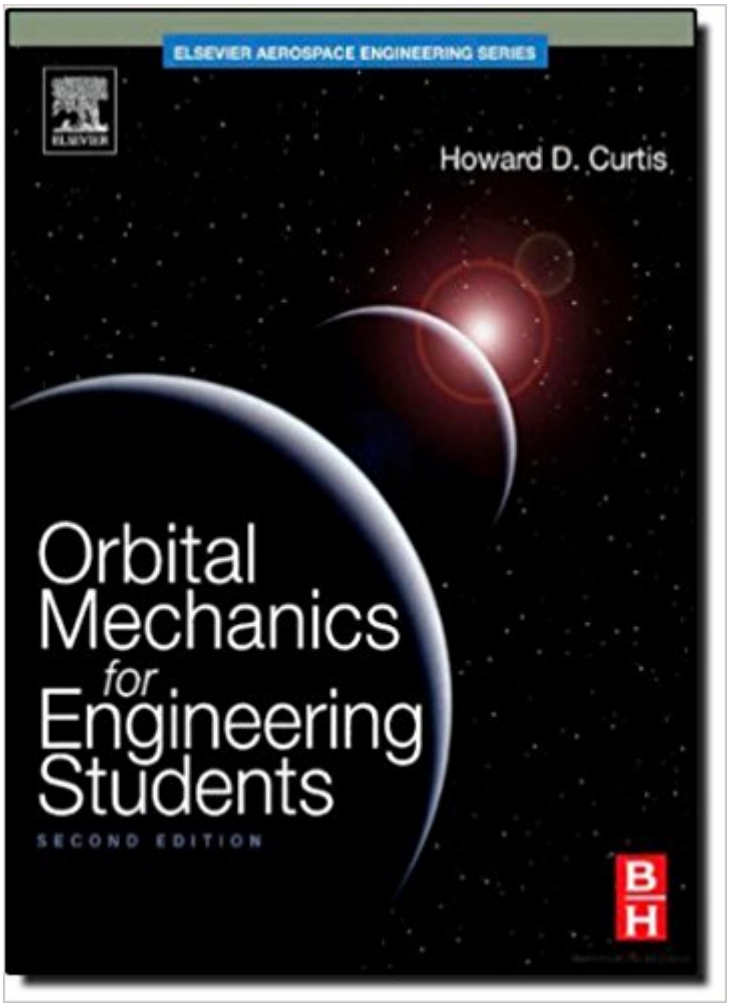
Orbital Mechanics For Engineering Students, Second Edition (Aerospace Engineering)



Synopsis

Orbital Mechanics for Engineering Students, Second Edition, provides an introduction to the basic concepts of space mechanics. These include vector kinematics in three dimensions; Newtonâ ™s laws of motion and gravitation; relative motion; the vector-based solution of the classical two-body problem; derivation of Keplerâ ™s equations; orbits in three dimensions; preliminary orbit determination; and orbital maneuvers. The book also covers relative motion and the two-impulse rendezvous problem; interplanetary mission design using patched conics; rigid-body dynamics used to characterize the attitude of a space vehicle; satellite attitude dynamics; and the characteristics and design of multi-stage launch vehicles. Each chapter begins with an outline of key concepts and concludes with problems that are based on the material covered. This text is written for undergraduates who are studying orbital mechanics for the first time and have completed courses in physics, dynamics, and mathematics, including differential equations and applied linear algebra. Graduate students, researchers, and experienced practitioners will also find useful review materials in the book. NEW: Reorganized and improved discusions of coordinate systems, new discussion on perturbations and quarternions NEW: Increased coverage of attitude dynamics, including new Matlab algorithms and examples in chapter 10New examples and homework problems

Book Information

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Customer Reviews

TECHNOLOGY/Aeronautics & Astronautics TECHNOLOGY/Engineering/Mechanical Orbital

Mechanics for Engineering Students, Second Edition Howard D. Curtis "...Professor Curtis has crafted a text remarkably complete in detail and rigor for an introductory book. He communicates clearly in detail using text, illustration and exhaustive examples. These subjects typically challenge students, particularly during their initial exposure to the material. The superb examples will be extremely valuable to undergraduates and distinguishes this text from many others. This book should be given serious consideration for any undergraduate course in orbital mechanics or spacecraft dynamics." Ralph A. Sandfry, United States Air Force Academy, Journal of Guidance, Control, and Dynamics, vol 31, #2, AIAA. All the necessary tools? theory, practical examples and computational procedures? to learn orbital mechanics in one volume. Orbital mechanics is a cornerstone subject for aerospace engineering students. Maintaining the focus of the first edition, the author provides the foundation needed to understand the subject and proceed to advanced topics. Starting with the solution of the two-body problem and formulas for the different kinds of orbits, the text moves on to Kepler's equations, orbits in three dimensions, orbital elements from observations, orbital maneuvers, orbital rendezvous and interplanetary missions. This is followed by an introduction to spacecraft dynamics and a final chapter on basic rocket dynamics. The author's teach-by-example approach emphasizes the analytical procedures and computer-implemented algorithms required by today's students. There are a large number of worked examples, illustrations, end of chapter exercises (with answers) as well as many MATLABÂ® programs for use in homework and projects. The text can be used for one and two semester courses in space mechanics. Key Features . A new section on numerical integration methods applicable to space mechanics problems .Â A more centralized and improved discussion of coordinate systems and Euler angle sequences . An expanded development of relative motion in orbit . A new section on quaternions . New worked-out examples, illustrations and homework problems . New algorithms, MATLABÂ® scripts and simulations . Instructor's manual and lecture slides available online .Included online testing and assessment component helps students assess their knowledge of the topics Â Howard D. Curtis received his PhD from Purdue University's School of Aeronautics and Astronautics. He is Professor and former Chair of Aerospace Engineering at Embry-Riddle Aeronautical University in Florida, USA. He is a licensed Professional Engineer and an Associate Fellow of the American Institute of Aeronautics and Astronautics. --This text refers to an out of print or unavailable edition of this title.

I recently read the 2nd edition of this book. Though I am more advanced in my experience and knowledge of much of the material covered, I picked up this book for a great deal and thought it

would be interesting to brush up on some basics in a few areas. I also always enjoy seeing the different approaches used by various authors when covering a particular topic within such a subject area. I must say that this is one of the best introductions to orbital mechanics and astrodynamics that I’ve ever come across.There are a few minor errors in the 2nd edition and the errata sheet is available at the publisher’s website if you look for it. Again, they are few in number and very minor. I have read many very technical books from advanced dynamics to advanced radar theory and I can tell you it is rare to come across a text that has absolutely no errors, regardless of how many peers review the work prior to publication. In writing many technical works of my own in my career, including complex mathematical algorithms, having those works peer reviewed, as well as participating in the peer review of others’ works, I have noticed a phenomenon at work that helps to ensure that at least some errors eventually make it through to publication. When you are intimately familiar with a subject, I believe the brain will occassionally read what is supposed to be on the page rather than what actually is. However, the few errors that are present (less than two pages, large type and large line spacing on the errata sheet) are more than overshadowed by the overall quality and content of the book.I urge you to ignore the personal attacks of one reviewer and consider the content and worthiness of the work. Also note that some of the prior reviews have nothing to do with the book itself or its content (e.g. complaints about delivery problems, getting the wrong version when purchasing the Kindle edition, etc). These affect the overall rating of the book even when they do not critique the work itself.The explanations provided by the author are very clear and concise. The ideal combination of content. It does expect you to know a little calculus to follow some of the derivations but that shouldn’t be an obsticle to applying the knowledge of the end-results of the derivations.I am particularly pleased by the consistency in use of notation, something that I cannot say for many works on more advanced topics. Standard, widely-accepted vector, matrix and calculus notation is utilized and kept consistent within the text and between the text and the figures. I have authored many technical works in my career (published only within DoD programs) and have a deep understanding of the difficulty in expressing complex concepts in the form of graphical aids to support the discussion in the text. Especially without using color and shading to assist in properly depicting three-dimensional concepts. While the illustrations in this text aren’t as complex as many I have had to produce, I was impressed by how well simple black-and-white line drawings and gray-shaded drawings were used in this work.The topics covered, and the examples presented, provide a rather comprehensive introduction to the subject matter.I urge you to use ’s "Look Inside" feature to review the table of contents. I found some of the example problems to be rather unique and interesting compared to typical examples encountered in other works.I’ll admit that I skipped the

sections on parabolic and hyperbolic orbits as they did not of particular interest to me.However, I have no problems recommending this text to anyone (with a little calculus background and a little physics background preferred) who need to obtain a good introduction to orbital mechanics/fundamental astrodynamics. This book will provide you with a solid foundation to continue studying more advanced subjects in space flight dynamics, satellite attitude determination/control, mission planning, tracking, re-entry dynamics, and more.In summary, a great introduction and worthy of the price.

In my undergrad as an aerospace engineer, I ran into some really poor books, but it’s textbooks like Curtis that really help you understand the subject that are simply amazing. I like Anderson’s Introduction to Fluid Dynamics and Introduction to Flight, but there’s nothing that beats this book, in my opinion. (Note: I have the second edition, which I hear is way better than the first)Pros:-Very clear and concise derivations-Exercises line up well with sample problems-BUT they aren’t all "replace the numbers" questions-Clearly identifies variables, which can sometimes get confusing with the variable overload that is orbital mechanics-Truely a complete high level overview of almost every facet of modern orbital mechanics-Depth where you need in ton the most important subjects, like the basics-Last but DEFINITELY not least: VERY lightweight (way less than SMAD!) and the price, making it easy to bring to classCons:-If you want glossy pages, this isn’t for you. I had a friend spill coffee on it, and there was no chance of a revival-Does very little in the way of translunar orbits, and is missing the ICBM information from Fundamentals of Astrodynamics, which I used as a companion to this course

Curtis deserves credit for managing to make the material described easy enough to swallow that you can basically jump into this material even cold turkey. The dialogue and derviations are easily followable, and theres enough of an intro on kinematics and a review of some of the basic geometry and algebra that you wont require a second textbook to translate the first.The problems arrise in the examples. While I appluad the majority of them, its readily apparent that they were performed by a assistant or a student, as theres just enough errors to radically confuse aynone trying to copy the problem to get an understanding of the process. And while the examples are plentuiful enough to be incredibly useful, they cover only the barest bones. I can understand not wanting to spend 1/3 of the book performing example problems, a few of the more complex subjects would’ve been greatly assistaed by just a handful of problems that involved more than just perfect universes with circular, coplanar orbits using point masses. And even the homework problems are no respite, as some of

the chapters had a grand total of 8 problems, meaning at most 4 had in-book defined answers for personal study.Overall, for such a dry and complex subject matter, this book is extremely useful, but just 20-30 more pages of problems and exmaples would've been a termendous boon.

Bought this book right before the second edition came out. Some of my classmates bought the second edition, so the class has a mixture of the two books. The professor is constantly pointing out errors and typos in this edition. There is supposedly an errata available, I have not yet found it. Aside from the practice problem and equation numbering, (and correcting the errors) the two editions are essentially the same.As a text, the explanations of phenomena and derivations of equations are well laid out and can be followed without too much difficulty if you have a good grounding in vector algebra. An understanding of calculus and ordinary differential equations also aids understanding. The MATLAB code found in the appendices is good and can be used as-is or as a starting point for writing your own. If you can get a .pdf of that appendix, though, it makes cut-and-paste-and-run a whole lot easier.My only other quibble is that the tables with planetary constants (mass, radius, orbit, mu, etc.) are split into two tables and are buried in an appendix, rather than in one table inside the cover. I've tabbed that page, but it would make more sense to make those much-referenced figures more accessible.

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