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ZAQ55V - DWAYNE HEIDI

The investigation of minor solar system bodies, such as comets and asteroids, using spacecraft requires an understanding of orbital motion in strongly perturbed environments. The solutions to a wide range of complex and challenging problems in this field are reviewed in this comprehensive and authoritative work.
Orbital Mechanics for Engineering Students, Second Edition, provides an introduction to the basic concepts of space mechanics. These include vector kinematics in three dimensions; Newton's laws of motion and gravitation; relative motion; the vector-based solution of the classical two-body problem; derivation of Kepler'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 10 New examples and homework problems
This book describes the mechanics or physics of resident space objects (RSOs) in orbits due to the gravitational force of the central mass, like the Earth. In other words, it's about the obit of satellites and other RSOs. Part 1 applies the laws of Newton and Kepler, considers 2-body and N-body problems, and explores Jacobi's constant and Lagrangian points. Using calculus, geometry, trigonometry, and algebra, it develops the equations of orbits and motion, transforms reference frames to other frames, like Cartesian to True Equator, Mean Equinox (TEME). The book investigates orbital maneuvers with applications like Hohmann transfers, and interplanetary trajectories hyperbolic departures. We develop the orbital parameters, like the semilatus rectum, mean anomaly, eccentricity, inclination, and argument of periapsis. Part 2 explores and implements the NORAD two-line element (TLE) set and uses the content to propagate state vectors(position and velocity) to plot orbits and ground tracks. We employ the SGD4 (LEO) propagator and SPD4 (deep space) propagator to validate orbits against Revisiting Spacetrack Report #3. We then use the results to project orbits forward in time and to simulate from selected orbital elements.

This is a short course covering introductory topics in orbital mechanics. It focuses on Satellite Perturbations. This course is structured to present the basic concepts without the in-depth theoretical background and mathematical derivations that commonly accompany an academic presentation of the subject. My intention is to introduce orbital mechanics in a simplified manner to those with no previous background in the field, or to provide a review to those who have studied the subject previously. Readers should have a familiarity with differential and integral calculus and differential equations to help understand some of the equations presented. The form of this short course is like the many short courses I've taught at government agencies and private corporations during my thirty-five-year career as an aerospace engineering professor at Auburn University. It presents the material in a simplified outline/bullet format using many understandable figures, rather than using lengthy, detailed explanations with complex mathematical derivations and proofs. It provides the practical equations that are useful to the practicing engineer working in orbital mechanics. The objectives of this short course are to: Review coordinate systems, time and timekeeping, basic definitions, and terminology commonly used in orbital mechanics; Present the fundamentals of two-body orbital mechanics, i.e., the study of the motion of natural and artificial bodies in space; Review Newton's Laws of Motion, Newton's Law of Universal Gravitation, and Kepler's Laws; Describe applications of two-body orbital mechanics, including launching, ground tracks, orbital transfers, plane changes, interplanetary trajectories, and planetary capture; Review alternate solutions to Kepler's Problem, including the f and g function solutions and the f and g series solutions. The material presented is usually covered in a first course in orbital mechanics except that there is no required homework, quizzes, projects, computer programs, or examinations. I believe that even a novice reading through this material will gain an in-depth understanding of two-body orbital mechanics. My former students should recognize everything in this presentation, and if they didn't learn it the first time, they can learn it now through this simplified short course with a lot less work. Orbital mechanics is not easy, but it's my goal to make it enjoyably simple once the basic laws are understood. To do so, I've attempted to present the difficult concepts as clearly as possible to facilitate that understanding. Completion of this short course should enhance the knowledge base of all those who read through its content. This short course is part of a series I've developed as a Professor at Auburn University. Others in this series that will be available soon include: Orbital Mechanics, Part II: Satellite Perturbations; State Estimation and Kalman Filtering; and Fundamentals of Inertial Navigation and Missile Guidance. If you have questions, please contact me at: ciccida@auburn.edu.
This textbook covers fundamental and advanced topics in orbital mechanics and astrodynamics to expose the student to the basic dynamics of space flight. The engineers and graduate students who read this class-tested text will be able to apply their knowledge to mission design and navigation of space missions. Through highlighting basic, analytic and computer-based methods for designing interplanetary and orbital trajectories, this text provides excellent insight into astronautical techniques and tools. This book is ideal for graduate students in Astronautical or Aerospace Engineering and related fields of study, researchers in space industrial and governmental research and development facilities, as well as researchers in astronautics. This book also: · Illustrates all key concepts with examples · Includes exercises for each chapter · Explains concepts and engineering tools a student or experienced engineer can apply to mission design and navigation of space missions · Covers fundamental principles to expose the student to the basic dynamics of space flight
Statistical Orbit Determination presents fundmentals of orbit determination--from weighted least squares approaches (Gauss) to today's high-speed computer algorithms that provide accuracy within a few centimeters. Numerous examples and problems are provided to enhance readers' understanding of the material. Covers such topics as coordinate and time systems, square root filters, process noise techniques, and the use of fictitious parameters for absorbing un-modeled and incorrectly modeled forces acting on a satellite. Examples and exercises serve to illustrate the principles throughout each chapter.

A lively study of orbital mechanics by the writer responsible for the computer simulations and systems analysis for the Saturn V moon rocket, Project Skylab and many others. Provides thorough coverage of all background theories, including unusual concepts and paradoxes that will enhance appreciation of this field. Includes discussion of rocket propulsion and optimization of techniques for maximizing payload and minimizing fuel consumption, plus complete coverage of the interaction of space vehicles and space bodies.
Orbital mechanics is a cornerstone subject for aerospace engineering students. However, with its basis in classical physics and mechanics, it can be a difficult and weighty subject. Howard Curtis - Professor of Aerospace Engineering at Embry-Riddle University, the US's #1 rated undergraduate aerospace school - focuses on what students at undergraduate and taught masters level really need to know in this hugely valuable text. Fully supported by the analytical features and computer based tools required by today's students, it brings a fresh, modern, accessible approach to teaching and learning orbital mechanics. A truly essential new resource. A complete, stand-alone text for this core aerospace engineering subject Richly-detailed, up-to-date curriculum coverage; clearly and logically developed to meet the needs of students Highly illustrated and fully supported with downloadable MATLAB algorithms for project and practical work; with fully worked examples throughout, Q&A material, and extensive homework exercises.
Designed to be used as a graduate student textbook and a ready reference for the busy professional, Orbital Mechanics, Second Edition is structured so that you can easily look up the things you need to know. Included in the second edition are two added chapters on Orbital Coverage and on Optimal Low-Thrust Orbit Transfers, updates on several chapters, and basic PC-compatible software, which can be used to solve selected problems in the text. The well-organized chapters cover every basic aspect of orbital mechanics, from celestial relationships to the problems of space debris.

This is a short course covering introductory topics in orbital mechanics. It focuses on the Two-Body Problem. This course is structured to present the basic concepts without the in-depth theoretical background and mathematical derivations that commonly accompany an academic presentation of the subject. My intention is to introduce orbital mechanics in a simplified manner to those with no previous background in the field, or to provide a review to those who have studied the subject previously. Readers should have a familiarity with differential and integral calculus and differential equations to help understand some equations presented.The form of this short course is like the many short courses I've taught at government agencies and private corporations during my thirty-five-year career as an aerospace engineering professor at Auburn University. It presents the material in a simplified outline/bullet format using many understandable figures, rather than using lengthy, detailed explanations with complex mathematical derivations and proofs. It provides the practical equations that are useful to the practicing engineer working in orbital mechanics. The objectives of this short course are to: - Review coordinate systems, time and timekeeping, basic definitions, and terminology commonly used in orbital mechanics.- Present the fundamentals of two--body orbital mechanics, i.e., the study of the motion of natural and artificial bodies in space.- Review Newton's Laws of Motion, Newton's Law of Universal Gravitation, and Kepler's Laws.- Describe applications of two-body orbital mechanics, including launching, ground tracks, orbital transfers, plane changes, interplanetary trajectories, and planetary capture. - Review alternate solutions to Kepler's Problem, including the f and g function solutions and the f and g series solutions.T material presented is usually covered in a first course in orbital mechanics except that there is no required homework, quizzes, projects, computer programs, or examinations. I believe that even a novice reading through this material will gain an in-depth understanding of two-body orbital mechanics. My former students should recognize everything in this presentation, and if they didn't learn it the first time, they can learn it now through this simplified short course with a lot less work. Orbital mechanics is not easy, but it's my goal to make it enjoyably simple once the basic laws are understood. To do so, I've attempted to present the difficult concepts as clearly as possible to facilitate that understanding. Completion of this short course should enhance the knowledge base of all those who read through its content.This short course is part of a series I've developed as a Professor at Auburn University. Others in this series that will be available soon include: Orbital Mechanics, Part II: Satellite PerturbationsState Estimation and Kalman FilteringFundamentals of Inertial Navigation and Missile GuidanceIf you have questions, please contact me at: ciccida@auburn.eduDavid A. CicciAuburn, Alabama
Teaching text developed by U.S. Air Force Academy and designed as a first course emphasizes the universal variable formulation. Develops the basic two-body and n-body equations of motion; orbit determination; classical orbital elements, coordinate transformations; differential correction; more. Includes specialized applications to lunar and interplanetary flight, example problems, exercises. 1971 edition.
Never HIGHLIGHT a Book Again Includes all testable terms, concepts, persons, places, and events. Cram101 Just the FACTS101 studyguides gives all of the outlines, highlights, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanies: 9780872893795. This item is printed on demand.

In this 'information age' satellites are playing an increasingly important role in everything from communication and navigation to the military and weather. The command and control of satellites is based on the work of Johannes Kepler (1571-1630) and the science that evolved from his fundamental theories. The physics involved in the command and control of satellites is usually categorized as orbital mechanics. Orbital mechanics is based on the desire to predict the path of a satellite in it's orbit around the earth. One of the first requirements is to develop a co-ordinate system that is easy to use and measure and defines the motion of body or satellite in its orbit. After this is accomplished the propagation of the orbital path needs to be calculated. There are numerous ways to do this. A seminal work in this procedure is "Fundamentals of Astrodynamics" by Bate, Mueller & White and "Methods of Orbit Determination" by Escobal. The next problem to address are the numerous perturbation effects. The most prominent of these effects are due to the fact that the earth is not a perfect sphere (it is oblate), the moons orbit produces a periodically disruptive effect on the orbiting body; atmospheric drag, solar radiation pressure and the precession of the earth about its axis also alter the theoretical orbit. Relativistic effects play a role in the station-keeping of the satellite as do all the above perturbations. The next step in the command and control of the satellite involves the dynamics of space flight and the mechanics of maneuvering a body in orbit by means of thrust vectors, calculating delta-v requirements. This book outlines the unclassified methods of calculating and controlling the orbits of satellites.

A fascinating introduction to the basic principles of orbital mechanics It has been three hundred years since Isaac Newton first formulated laws to explain the orbits of the Moon and the planets of our solar system. In so doing he laid the groundwork for modern science's understanding of the workings of the cosmos and helped pave the way to the age of space exploration. Adventures in Celestial Mechanics offers students an enjoyable way to become acquainted with the basic principles involved in the motions of natural and human-made bodies in space. Packed with examples in which these principles are applied to everything from a falling stone to the Sun, from space probes to galaxies, this updated and revised Second Edition is an ideal introduction to celestial mechanics for students of astronomy, physics, and aerospace engineering. Other features that helped make the first edition of this book the text of choice in colleges and universities across North America include: * Lively historical accounts of important discoveries in celestial mechanics and the men and women who made them * Superb illustrations, photographs, charts, and tables * Helpful chapter-end examples and problem sets

Adapted from the author's teaching notes developed over nearly ten years of teaching introductory orbital mechanics, this text focuses on the physical phenomena and analytical procedures required to understand and accurately predict the behaviour of orbiting spacecraft.

Aimed at students, faculty and professionals in the aerospace field, this book provides practical information on the development, analysis, and control of a single and/or multiple spacecraft in space. This book is divided into two major sections: single and multiple satellite motion. The first section analyses the orbital mechanics, orbital perturbations, and attitude dynamics of a single satellite around the Earth. Using the knowledge of a single satellite motion, the translation of a group of satellites called formation flying or constellation is explained. Formation flying has been one of the main research topics over the last few years and this book explains different control approaches to control the satellite attitude motion and/or to maintain the constellation together. The control schemes are explained in the discrete domain such that it can be easily implemented on the computer on board the satellite. The key objective of this book is to show the reader the practical and the implementation process in the discrete domain. Explains the orbital motion and principal perturbations affecting the satellite Uses the Ares V rocket as an example to explain the attitude motion of a space vehicle Presents the practical approach for different control actuators that can be used in a satellite

Although its aim is to provide the engineer and scientist with a concise treatment of the basic elements of orbital mechanics, this book should also be suitable for senior undergraduate and graduate courses. The author begins with a discussion of the physics of the two-body problem, then enters into a discussion of launching satellites into orbit.

This modern presentation guides readers through the theory and practice of satellite orbit prediction and determination. Starting from the basic principles of orbital mechanics, it covers elaborate force models as well as precise methods of satellite tracking. The accompanying CD-ROM includes source code in C++ and relevant data files for applications. The result is a powerful and unique spaceflight dynamics library, which allows users to easily create software extensions. An extensive collection of frequently updated Internet resources is provided through WWW hyperlinks.

This thesis consists of an interactive program that enables the student to study the orbital motion of satellites around the earth. The student can investigate the shape of a variety of orbits by varying the initial position and velocity of the satellite, or by supplying select orbital parameters i.e. initial orbital radius, eccentricity, and inclination. Satellite maneuvers can also be studied, like transfer orbits and inclination changes, by command velocity changes at any location in the orbit. Also the effects of the perturbing forces due to the oblateness of the earth, drag for low earth orbits, and gravitational attraction from the sun and moon can be investigated. The orbits are displayed in either the perifocal coordinate system around a model of the earth, or the ground track can be displayed on a map of the world. Orbital data is displayed below the orbital plot. The display is enabled by the use of display integrated software system and plotting language (DISSPLA) subroutines. Orbital mechanics, Unperturbed and perturbed orbit, FORTRAN program, DISSPLA graphics.

Annotation Designed to be used as a graduate student textbook and a ready reference for the busy professional, this third edition of "Orbital Mechanics is structured so that you can easily look up the things you need to know. This edition includes more recent developments in space exploration (e.g. Galileo, Cassini, Mars Odyssey missions). Also, the chapter on space debris was rewritten to reflect new developments in that area. The well-organized chapters cover every basic aspect of orbital mechanics, from celestial relationships to the problems of space debris. The book is clearly written in language familiar to aerospace professionals and graduate students, with all of the equations, diagrams, and graphs you would like to have close at hand. An updated software package on CD-ROM includes: HW Solutions, which presents a range of viewpoints and guidelines for solving selected problems in the text; Orbital Calculator, which provides an interactive environment for the generation of Keplerian orbits, orbital transfer maneuvers, and animation of ellipses, hyperbolas, 'and interplanetary orbits; and Orbital Mechanics Solutions

Newton was the first to realize that objects could, in theory, be sent into orbit around Earth. Explore how this works in practice, using the ideas of energy and angular momentum to study how satellites, moons, planets, and stars move through space.

Celestial Mechanics and Astrodynamics

This volume is designed as an introductory text and reference book for graduate students, researchers and practitioners in the fields of astronomy, astrodynamics, satellite systems, space sciences and astrophysics. The purpose of the book is to emphasize the similarities between celestial mechanics and astrodynamics, and to present recent advances in these two fields so that the reader can understand the inter-relations and mutual influences. The juxtaposition of celestial mechanics and astrodynamics is a unique approach that is expected to be a refreshing attempt to discuss both the mechanics of space flight and the dynamics of celestial objects. “Celestial Mechanics and Astrodynamics: Theory and Practice” also presents the main challenges and future prospects for the two fields in an elaborate, comprehensive and rigorous manner. The book presents homogenous and fluent discussions of the key problems, rendering a portrayal of recent advances in the field together with some basic concepts and essential infrastructure in orbital mechanics. The text contains introductory material followed by a gradual development of ideas interweaved to yield a coherent presentation of advanced topics.

Never HIGHLIGHT a Book Again! Virtually all of the testable terms, concepts, persons, places, and events from the textbook are included. Cram101 Just the FACTS101 studyguides give all of the outlines, highlights, notes, and quizzes for your textbook with optional online comprehensive practice tests. Only Cram101 is Textbook Specific. Accompanys: 9780750661690 .

For nearly two decades, Orbital Mechanics by John E. Prussing and Bruce A. Conway has been the most authoritative textbook on space trajectories and orbital transfers. Completely revised and updated, this edition provides: * Current data and statistics, along with coverage of new research and the most recent developments in the field * Three new chapters: "The Three-Body Problem" (Ch. 4), "Continuous-Thrust Transfer" (Ch. 8), and "Canonical Systems and the Lagrange Equations" (Ch. 12) * New material on multiple-revolution Lambert solutions, gravity-assist applications, and the state transition matrix for a general conic orbit * New examples and problems throughout * A new Companion Website with PowerPoint slides (www.oup.com/us/prussing)

"Orbital and Celestial Mechanics" affords engineering students, professors, and researchers alike an opportunity to cultivate the mathematical techniques necessary for this disciplineas well as physics and trajectory mechanicsusing the familiar and universal concepts of classical physics. For nonspecialists and students unfamiliar with some of the underlying math principles, the Vinti Spheroidal Method demonstrates computer routines for accurately calculating satellite orbit and ballistic trajectory. More than 20 years ago, Dr. Vintis revolutionary method was used aboard a ballistic missile targeting program with great success. His work continues to enable both students and professionals to predict position and velocity vectors for satellites and ballistic missiles almost as accurately as numerical integration. Now, the best Vinti algorithms and companion computer source codes are available in one comprehensive package. System Requirements: PC-compatible with MS Windows 95, FORTRAN, and Visual C++ Powerstation 4.0; also mentions UNIX Powerstation with Vi editor.

Regularized equations of motion can improve numerical integration for the propagation of orbits, and simplify the treatment of mission design problems. This monograph discusses standard techniques and recent research in the area. While each scheme is derived analytically, its accuracy is investigated numerically. Algebraic and topological aspects of the formulations are studied, as well as their application to practical scenarios such as spacecraft relative motion and new low-thrust trajectories.

Orbital Mechanics for Engineering Students, Fourth Edition, is a key text for students of aerospace engineering. While this latest edition has been updated with new content and included sample problems, it also retains its teach-by-example approach that emphasizes analytical procedures, computer-implemented algorithms, and the most comprehensive support package available, including fully worked solutions, PPT lecture slides, and animations of selected topics. Highly illustrated and fully supported with downloadable MATLAB algorithms for project and practical work, this book provides all the tools needed to fully understand the subject. Provides a new chapter on the circular restricted 3-body problem, including low-energy trajectories Presents the latest on interplanetary mission design, including non-Hohmann transfers and lunar missions Includes new and revised examples and sample problems

A clear, concise introduction to all the major features of solar system dynamics, ideal for a first course.