

Spinning Tops and Gyroscopic Motions

with 66 Illustrations



BY
PROFESSOR
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Spinning Tops And Gyroscopic Motions

John Perry



Spinning Tops And Gyroscopic Motions:

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Spinning Tops and Gyroscopic Motions John Perry, 1957 *An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion* Harold Crabtree, 1967 **An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion** Harold Crabtree, 2007-04-01 An Unabridged Reprinting Of The 1909 Edition To Include All Figures Behavior Of Ordinary Spinning Tops Tops Containing Liquid Celts The Gyroscopic Top The Gyroscope Rotation About A Fixed Axis Representation Of Angular Velocity Precession Discussion Of The Phenomena Described In The Introductory Chapter Rise And Fall Of The Top Behavior Of A Top Containing Liquid The Gyroscopic Top Effect Of Reactions In The Mounting Of A Gyroscope Explanation Of The Behavior Of Celts The Starting Of Precession Oscillations Of The Gyroscope Conservation Of Angular Momentum Illustrations Summary Of Results Increase Of Precession Of A Dying Top Inertia Dipping Of A Gyroscope At The Start Of Precession Oscillations Summary Of Results Principle Of Energy Applied To A Rising Top Principle Of Energy Applied To A Dying Top Energy Lost In Heat Electrical Analogy Practical Applications The Steering Of A Torpedo Steadying Vessels At Sea Brennan s Monorail Steady Motion Of A Top General Motion Of A Top Moving Axes Stability Of Rotation Periods Of Oscillation Miscellaneous Examples Appendix Answers To Examples Answers To Questions **Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion** Harold Crabtree, 2019 [Spinning Tops and Gyroscopic Motions](#) John Perry, 1957 **An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion** Harold Crabtree, 2013-09 This historic book may have numerous typos and missing text Purchasers can usually download a free scanned copy of the original book without typos from the publisher Not indexed Not illustrated 1914 edition Excerpt that so long as the axle lies North and South and is horizontal it is not affected by the action of gravity If for any reason it is displaced from the meridian but not so far as a West East position the rotation of the earth still causes a dip and therefore the gravity couple comes into play restoring CN to the North South position while at the same time a couple is produced by air currents which eliminates dip as CN approaches the meridian A mathematical discussion of the forces called into play is given in Appendix V CHAPTER VI STEADY MOTION OF A TOP 75 The student is reminded at the commencement of this chapter that when a solid body is under consideration i Angular velocity about any line means total angular velocity not relative to some moving plane unless this is expressly stated ii Angular velocity about a line which is moving means total angular velocity about the line fixed in space with which the moving line happens to be coinciding at the instant in question 76 In the preceding chapter the bodies whose rotation we have discussed have been symmetrical bodies as for example a fly wheel and all the rotations have been about an axis of symmetry i e the axle If the axis were not an axis of symmetry an angular velocity about this axis would in general involve angular momentum about this axis and also about the two axes perpendicular to it as is shown in the next article In this chapter we propose to discuss the equations of motion of an ordinary

spinning top in which case it is clear that only the axle of the top is an axis of symmetry and any other axis is not But we shall see in Art 79 that since the top is a solid of revolution any axis perpendicular to the axle of the top is the same **An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion** Harold Crabtree,1909 **An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion (Classic Reprint)** Harold Crabtree,2017-09-17 Excerpt from An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion In this attempt to present an elementary and at the same time a scientific view of the subject I have expanded several of the suggestive ideas put forward in Dynamics of Rotation by Professor Worthington to whom is due a large debt of thanks for much liberal criticism and assistance in the earlier chapters and for permission to borrow his article on Brennan s Monorail About the Publisher Forgotten Books publishes hundreds of thousands of rare and classic books Find more at www.forgottenbooks.com This book is a reproduction of an important historical work Forgotten Books uses state of the art technology to digitally reconstruct the work preserving the original format whilst repairing imperfections present in the aged copy In rare cases an imperfection in the original such as a blemish or missing page may be replicated in our edition We do however repair the vast majority of imperfections successfully any imperfections that remain are intentionally left to preserve the state of such historical works [An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion - Scholar's Choice Edition](#) Harold Crabtree,2015-02-12 This work has been selected by scholars as being culturally important and is part of the knowledge base of civilization as we know it This work was reproduced from the original artifact and remains as true to the original work as possible Therefore you will see the original copyright references library stamps as most of these works have been housed in our most important libraries around the world and other notations in the work This work is in the public domain in the United States of America and possibly other nations Within the United States you may freely copy and distribute this work as no entity individual or corporate has a copyright on the body of the work As a reproduction of a historical artifact this work may contain missing or blurred pages poor pictures errant marks etc Scholars believe and we concur that this work is important enough to be preserved reproduced and made generally available to the public We appreciate your support of the preservation process and thank you for being an important part of keeping this knowledge alive and relevant [Spinning Tops and Gyroscopic Motion](#) ,1957 **Spinning Tops and Gyroscopic Motions** John Perry,1957 **Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion** Harold Crabtree,1977-06-01 *Theory of Gyroscopic Effects for Rotating Objects* Ryspek Usubamatov,2025-08-12 This book highlights an analytical solution for the dynamics of axially rotating objects It also presents the theory of gyroscopic effects explaining their physics and using mathematical models of Euler s form for the motion of movable spinning objects to demonstrate these effects The major themes and approaches are represented by the spinning disc and the action of the system of interrelated inertial torques generated by the centrifugal and Coriolis forces as well as the change in the angular

momentum The interrelation of inertial torques is based on the dependency of the angular velocities of the motions of the spinning objects around axes by the principle of mechanical energy conservation These kinetically interrelated torques constitute the fundamental principles of the mechanical gyroscope theory that can be used for any rotating objects of different designs like rings cones spheres paraboloids propellers etc Lastly the mathematical models for the gyroscopic effects are validated by practical tests This book is highlighted in its already third edition The new edition comprises many new sections for several chapters or new chapters The most important ones are Chapter 3 includes a mathematical model for the section inertia torques acting on the spinning annulus and thin ring The latter does not have a full solution because the handbooks comprise simplified parameters that cannot be used for an exact solution Chapter 4 offers mathematical model for the arbitrary disposition of the spinning object in space that shows the action of the additional four inertial torques acting on the third axis and new dependencies of gyroscope motions Chapter 7 now presents mathematical model for the gyroscope nutation with a full solution The known mathematical model presents a partial solution due to the complexity of the problem

An Elementary Treatment of the Theory of Spinning Tops and Gyroscopic Motion ... With Illustrations. Harold Crabtree, 1914 *CLASSICAL MECHANICS* RAO, K. SANKARA, 2005-01-01 The knowledge of classical mechanics is vital for understanding advanced technologies in several areas such as automation industrial process control and aerospace The present text is an outcome of the author's long experience in teaching this subject to postgraduate students and his work as a scientist in the area of satellite rocket motion at Vikram Sarabhai Space Centre The basic concepts and principles of mechanics are explained in clear simple terms and illustrated through several examples Keeping student accessibility in mind the book is written in an expository manner aimed at conveying a deep and coherent understanding of the dynamics of a system of particles kinematics of a rigid body motion dynamics of a rigid body in space and orbital motion This is followed by the description of Lagrange and Hamilton methods and the special theory of relativity New topics such as rocket dynamics along with vehicle optimization and three body and n body problems are also presented for the benefit of those students who wish to pursue advanced study in celestial space mechanics Solved examples and exercises reinforce conceptual understanding and highlight application of principles to real world problems Multiple choice questions are modelled on examination pattern of various Indian universities GATE and other competitive examinations The book is well suited for postgraduate students of mathematics physics and engineering particularly those studying aerospace civil and mechanical engineering Scientists and engineers engaged in the design of multi stage rockets and study of orbits of satellites would also find the book a useful compact source of reference *Intermediate Classical Mechanics* Yih-Hsing Pao, Li-Sheng Wang, 2025-03-28 This book describes the basic concepts and principles of classical mechanics in the intermediate level Given the perspective that different mechanical problems require an appropriate approach drawn from various methods or principles a textbook discussing multiple methods or principles in mechanics is highly desirable Additionally a good textbook

should include historical context on the motivation and the development of the methods or principles allowing students to gain insights that may help them discover new theories. However, after many years of teaching Dynamics in the graduate school, the authors were unable to find a suitable intermediate level textbook on classical mechanics which motivated them to begin writing this book. For the aforementioned reasons, this book includes the descriptions of various methods or principles in mechanics such as the Newton-Euler Principle, the d'Alembert Principle, Lagrangian methods, Gauss's Principle of Least Constraint, the Gibbs-Appell equation, Jourdain's equation, the Principle of Virtual Power, the Appell-Kane method, the Hamilton Principle, and the Hamiltonian mechanics, among others. Moreover, many historical remarks on the motivation and the development of the methods or principles are given in this book as well as numerous applications. The authors also believe that in studying the motion of a material body, different models may be used depending on the application. If the position of the body is of interest, a particle model may be chosen. If the orientation or attitude of the body is under consideration, a rigid body model should be adopted. If deformation is a concern, a model of deformable body should be applied. Consequently, a book in mechanics for engineers should encompass a variety of models of the body ranging from particles to continua such as solids or fluids. This book also meets that need.

Introduction to Machine Dynamics Mehrdaad Ghorashi, 2025-09-26

This book introduces machine dynamics, an essential competency important for many applications such as designing robots for manufacturing, materials handling, or the landing gear of an airplane; analyzing the motion of a piston in an internal combustion engine or a compressor; and designing a Mars Rover. Wherever a machine is used for force or power transmission or a mechanism creates a desired motion, the methods studied in this book provide the fundamental knowledge needed for optimal design. Specific sections are provided on different types of mechanisms and conditions that should be met for obtaining a desired performance, including kinematic analysis of mechanisms using direct differentiation, relative motion, kinematic coefficients, and instantaneous centers. The Newton-Raphson method for solving complex nonlinear position analysis problems is discussed, and the determination of dead and limit positions in mechanisms is presented. The relation between the angular velocity ratio theorem and the fundamental law of gearing is shown to provide a bridge between the concept of instantaneous centers and analyzing gears. Gears and gear trains are covered in detail, and calculation of gear ratios in fixed-axis and planetary gear trains using the rolling contact equations is illustrated. Finally, power and force transmission in machines is covered. Static and dynamic cases are analyzed, and the author shows how the static solutions can provide approximations for the dynamic problems where inertia effects are not significant (low inertia and low accelerations). Application of matrix algebra for solving the system of equations of equilibrium in statics or equations of motion in dynamics is also illustrated. Because of the importance of balancing in any application involving rotating machinery, static and dynamic balancing are analyzed. The book concludes with a brief coverage of three-dimensional dynamics, including Euler's equations and gyroscopic effect. Aimed at engineering students interested in machine dynamics across a range of disciplines, the book is

also ideal as a reference for practicing engineers with a good understanding of statics dynamics and matrix algebra

Introduction to Mechanics of Particles and Systems Costas J. Papachristou, 2020-09-09 This book is based on the author's lecture notes for his Introductory Newtonian Mechanics course at the Hellenic Naval Academy In order to familiarize students with the use of several basic mathematical tools such as vectors differential operators and differential equations it first presents the elements of vector analysis that are needed in the subsequent chapters Further the Mathematical Supplement at the end of the book offers a brief introduction to the concepts of differential calculus mentioned The main text is divided into three parts the first of which presents the mechanics of a single particle from both the kinetic and the dynamical perspectives The second part then focuses on the mechanics of more complex structures such as systems of particles rigid bodies and ideal fluids while the third part consists of 60 fully solved problems Though chiefly intended as a primary text for freshman level physics courses the book can also be used as a supplemental tutorial resource for introductory courses on classical mechanics for physicists and engineers The Romance of Words ... Ernest Weekley, 1911

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