

The Geometry Of Special Relativity

Special Relativity And Its Experimental Foundation Special Theory of Relativity The Roots of Special Relativity Introductory Special Relativity Lectures on Special Relativity Introduction to Special Relativity Special Relativity: A First Encounter The Special Theory of Relativity Einstein's Space-Time Special Relativity Challenging the Unchallengeable Special Relativity A Primer of Special Relativity Poincaré, Einstein and the Discovery of Special Relativity Special Relativity and Motions Faster Than Light Special Relativity in General Frames Elementary Approach to Special Relativity The Logic of Special Relativity FUNDAMENTALS OF SPECIAL AND GENERAL RELATIVITY, Revised Edition Physical Relativity Yuan-zhong Zhang S. P. Puri Peter Galison W G V Rosser M. G. Bowler Robert Resnick Domenico Giulini Anadijiban Das Rafael Ferraro Patricia M. Schwarz John D. Frey Michael Tsamparlis P. L. Sardesai Jean-Marc Ginoux Moses Fayngold Éric Gourgoulhon Helmut Günther S. J. Prokhovnik KRORI, K. D. Harvey R. Brown

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this book is divided into two parts in the first part we introduce the foundations of special relativity such as the inertial frame of reference the definition of simultaneity and einstein's two basic hypotheses we give the main relativistic effects e.g. the relativity of simultaneity velocity addition length contraction the apparent shape of a moving body time dilation doppler effect and the thomas precession in particular the simultaneity problem and slow transport of clocks are investigated in detail by means of the test theories of special relativity in the second part variant types of experiments performed up to now are analyzed and compared to the predictions of special relativity this shows that the experiments are a test of the two way speed of light but not of the one way speed of light

special theory of relativity is primarily intended as a textbook for the students of physics at the undergraduate level examining developments in the field as well as the predictions of special relativity that have taken place since 1959 its comprehensive coverage includes engaging explanations of the mathematical treatment as well as

the applications of the special theory of relativity

modern science has changed every aspect of life in ways that cannot be compared to developments of previous eras this four volume set presents key developments within modern physical science and the effects of these discoveries on modern global life the first two volumes explore the history of the concept of relativity the cultural roots of science the concept of time and gravity before during and after einstein s theory and the cultural reception of relativity volume 3 explores the impact of modern science upon global politics and the creation of a new kind of war and volume 4 details the old and new efforts surrounding the elucidation of the quantum world as well as the cultural impact of particle physics this reprint collection pools the best scholarship available collected from a large array of difficult to acquire books journals and pamphlets each volume begins with an introductory essay written by one of the top scholars in the history of science students and scholars of modern culture science and society will find these volumes a veritable research gold mine

a comprehensive introduction to the theory of special relativity for undergraduates based on the highly regarded textbook relativity and high energy physics includes numerous worked examples now thoroughly revised and expanded fully meets the needs of first year physics undergraduates

the aim of the book is to provide a clear concise and self contained discussion of both the structure of the theory of special relativity and its physical content the point of view is that of a practising physicist who uses relativity daily relativity is a branch of physics and is regarded as being neither mathematics nor philosophy particular care has been taken to elucidate those difficulties conceptual rather than mathematical which invariably snare the unwary or inexperienced the material is liberally illustrated with real examples and problems drawn from both high energy physics and from astrophysics

this book gives an excellent introduction to the theory of special relativity professor resnick presents a fundamental and unified development of the subject with unusually clear discussions of the aspects that usually trouble beginners he includes for example a section on the common sense of relativity his presentation is lively and interspersed with historical philosophical and special topics such as the twin paradox that will arouse and hold the reader s interest you ll find many unique features that help you grasp the material such as worked out examples summary tables thought questions and a wealth of excellent problems the emphasis throughout the book is physical the experimental background experimental confirmation of predictions and the physical interpretation of principles are stressed the book treats relativistic kinematics relativistic dynamics and relativity and electromagnetism and contains special appendices on the geometric representation of space time and on general relativity its organization permits an instructor to vary the length and depth of his treatment and to use the book either with or following classical physics these features make it an ideal companion for introductory courses

special relativity provides the foundations of our knowledge of space and time without it our understanding of the world and its place in the universe would be unthinkable this book gives a concise elementary yet exceptionally modern introduction to special relativity it is a gentle yet serious first encounter in that it conveys a true understanding rather than purely reports the basic facts only very elementary mathematical knowledge is needed to master it basic high school maths yet it will

leave the reader with a sound understanding of the subject special relativity a first encounter starts with a broad historical introduction and motivation of the basic notions the central chapters are dedicated to special relativity mainly following einstein s historical route later chapters turn to various applications in all parts of physics and everyday life unlike other books on the subject the current status of the experimental foundations of special relativity is accurately reported and the experiments explained this book will appeal to anyone wanting a introduction to the subject as well as being background reading for students beginning a course in physics

based on courses taught at the university of dublin carnegie mellon university and mostly at simon fraser university this book presents the special theory of relativity from a mathematical point of view it begins with the axioms of the minkowski vector space and the flat spacetime manifold then it discusses the kinematics of special relativity in terms of lorentz tranformations and treats the group structure of lorentz transformations extending the discussion to spinors the author shows how a unimodular mapping of spinor vector space can induce a proper orthochronous lorentz mapping on the minkowski vector space the second part begins with a discussion of relativistic particle mechanics from both the lagrangian and hamiltonian points of view the book then turns to the relativistic classical field theory including a proof of noether s theorem and discussions of the klein gordon electromagnetic dirac and non abelian gauge fields the final chapter deals with recent work on classical fields in an eight dimensional covariant phase space

this excellent textbook offers a unique take on relativity theory setting it in its historical context ideal for those interested in relativity and the history of physics the book contains a complete account of special relativity that begins with the historical analysis of the reasons that led to a change in our view of space and time its aim is to foster a deep understanding of relativistic spacetime and its consequences for dynamics

this book provides a thorough introduction to einstein s special theory of relativity suitable for anyone with a minimum of one year s university physics with calculus it is divided into fundamental and advanced topics the first section starts by recalling the pythagorean rule and its relation to the geometry of space then covers every aspect of special relativity including the history the second section covers the impact of relativity in quantum theory with an introduction to relativistic quantum mechanics and quantum field theory it also goes over the group theory of the lorentz group a simple introduction to supersymmetry and ends with cutting edge topics such as general relativity the standard model of elementary particles and its extensions superstring theory and a survey of important unsolved problems each chapter comes with a set of exercises the book is accompanied by a cd rom illustrating through interactive animation classic problems in relativity involving motion

john d frey leads readers on a fascinating journey in this book that seeks to prove that albert einsteins theory of special relativity is all wrong he begins by sharing an overview of special relativity including its history principles and how these principles bring about time dilation and length contraction the author examines six experiments that show that the theorys claims and principles can disqualify themselves by producing impossible opposing results he also explains how experiments that supposedly have verified special relativity and its claims actually help prove that the theory is flawed behind this book was over 10 years of research by the author concerning every aspect of special relativity in addition the author consulted with over 30 professors of physics concerning his ideas and experiments and their

feedback was extremely important in the creation of this book written in everyday nontechnical language the book will make sense to those without a background in physics no matter what you do for a living you can participate in a vital discussion about our universe and join the author in challenging the unchallengeable

writing a new book on the classic subject of special relativity on which numerous important physicists have contributed and many books have already been written can be like adding another epicycle to the ptolemaic cosmology furthermore it is our belief that if a book has no new elements but simply repeats what is written in the existing literature perhaps with a different style then this is not enough to justify its publication however after having spent a number of years both in class and research with relativity i have come to the conclusion that there exists a place for a new book since it appears that somewhere along the way mathem ics may have obscured and prevailed to the degree that we tend to teach relativity and i believe theoretical physics simply using heavier mathematics without the inspiration and the mastery of the classic physicists of the last century moreover current trends encourage the application of techniques in producing quick results and not tedious conceptual approaches resulting in long lasting reasoning on the other hand physics cannot be done a la carte stripped from philosophy or to put it in a simple but dramatic context a building is not an accumulation of stones as a result of the above a major aim in the writing of this book has been the distinction between the mathematics of minkowski space and the physics of r ativity

a primer of special relativity1 is an unusually lucid introduction to the subject specifically written for indian students it is intended to give the beginner a firm grounding for a more advanced course in relativity an entire chapter is devoted to applications of the theory to elucidate a large number of topics the students b sc physics come across in modern physics detailed and well selected examples are used to illuminate aspects of the theory as well as to show techniques of application a large number of illustrative examples enables the students to gain confidence to solve any problem in relativity normally expected of b sc students the book meets the complete requirements of a textbook for b sc general and honours courses in special theory of relativity recommended by the u g c existing syllabi in a number of our universities have been taken into account in planning the book the structure of the book permits a lot of flexibility the book can therefore be used as a text for a number of existing courses with different allotted periods presently prevalent in many indian universities

1905 is probably the best known year in physics since it was the year of the discovery of the special theory of relativity for decades historiography has told us that albert einstein then a patent examiner in bern succeeded in developing this theory on his own overcoming all the difficulties that the greatest scientists of his time had not been able to solve however some have pointed out that before einstein s first publication in this field the french mathematician and physicist henri poincaré had obtained the same results which he had published several months before einstein yet today this theory is known as einstein s special theory of relativity thus considering the indisputable anteriority of poincaré s contributions there is only one real question that needs to be answered why didn t poincaré claim the authorship of special theory of relativity after recapping on the ideas and concepts of the special theory of relativity in a manner accessible to non specialists and recalling the historical context of the discovery of this theory we will answer this question and thus put finally an end to this long running controversy

while the theory of special relativity is often associated with the idea of traveling faster than light this book shows that in all these cases subtle forces of nature

conspire to prevent these motions being harnessed to send signals faster than the speed of light the author tackles these topics both conceptually with minimal or no mathematics and quantitatively making use of numerous illustrations to clarify the discussion the result is a joy to read for both scientists familiar with the subject and laypeople wishing to understand something of special relativity

special relativity is the basis of many fields in modern physics particle physics quantum field theory high energy astrophysics etc this theory is presented here by adopting a four dimensional point of view from the start an outstanding feature of the book is that it doesn't restrict itself to inertial frames but considers accelerated and rotating observers it is thus possible to treat physical effects such as the thomas precession or the sagnac effect in a simple yet precise manner in the final chapters more advanced topics like tensorial fields in spacetime exterior calculus and relativistic hydrodynamics are addressed in the last brief chapter the author gives a preview of gravity and shows where it becomes incompatible with minkowsky spacetime well illustrated and enriched by many historical notes this book also presents many applications of special relativity ranging from particle physics accelerators particle collisions quark gluon plasma to astrophysics relativistic jets active galactic nuclei and including practical applications sagnac gyroscopes synchrotron radiation gps in addition the book provides some mathematical developments such as the detailed analysis of the lorentz group and its lie algebra the book is suitable for students in the third year of a physics degree or on a masters course as well as researchers and any reader interested in relativity thanks to the geometric approach adopted this book should also be beneficial for the study of general relativity a modern presentation of special relativity must put forward its essential structures before illustrating them using concrete applications to specific dynamical problems such is the challenge so successfully met of the beautiful book by Éric gourgoulhon excerpt from the foreword by thibault damour

this book presents an alternative representation of einstein's special theory of relativity which makes special relativity much more comprehensible moreover one will come across a fundamental relationship between the special theory of relativity and the mechanics of space lattice in all previous formulations the einsteinian special principle of relativity in one or the other form is used as the starting point for special relativity in correspondence to this principle one takes it as granted apriori that all observers independent of their uniform motion to each other measure one and the same propagation velocity of a light signal this book is thought of as a lecture for physicists mathematicians and computer scientists and concentrates on the students of these fields the book should reach a broad circle of interested readers from the fields of natural sciences and philosophy and provide an invigorating experience for engineers

relativity apart from quantum mechanics is the greatest wonder in science unfolded single handedly in the 20th century by albert einstein the scientist developed general relativity as a logical sequel to special relativity this comprehensive book presents explication of the conceptual evolution and mathematical derivations of the theories of special and general relativity the book follows an einsteinian approach while explaining the concepts and the theories of relativity divided into 14 chapters the revised edition of the book covers elementary concepts of special relativity as well as the advanced studies on general relativity the recent theories like kerr geometry sagnac effect vaidya geometry raychaudhuri equation and gravitation physics vis à vis quantum physics are presented in easy to understand language and simple style in addition to it the book gives an in depth analysis on the applications of advanced theories like vaidya krori barua solution from author's own research works apart from that the book also discusses some of the isotropic and anisotropic cosmological models in detail the salient topics discussed in the revised edition of

the book are extrinsic curvature detection of gravitational waves early universe evolution of a dead star into a white dwarf or a neutron star or a black hole dark matter and dark energy this book is intended for the undergraduate and postgraduate students of physics and mathematics key features step by step derivation of equations easy demagogic approach review questions to widen the analytical understanding of the students

physical relativity explores the nature of the distinction at the heart of einstein s 1905 formulation of his special theory of relativity that between kinematics and dynamics einstein himself became increasingly uncomfortable with this distinction and with the limitations of what he called the principle theory approach inspired by the logic of thermodynamics a handful of physicists and philosophers have over the last century likewise expressed doubts about einstein s treatment of the relativistic behaviour of rigid bodies and clocks in motion in the kinematical part of his great paper and suggested that the dynamical understanding of length contraction and time dilation intimated by the immediate precursors of einstein is more fundamental harvey brown both examines and extends these arguments which support a more constructive approach to relativistic effects in einstein s terminology after giving a careful analysis of key features of the pre history of relativity theory he argues furthermore that the geometrization of the theory by minkowski in 1908 brought illumination but not a causal explanation of relativistic effects finally brown tries to show that the dynamical interpretation of special relativity defended in the book is consistent with the role this theory must play as a limiting case of einstein s 1915 theory of gravity the general theory of relativity appearing in the centennial year of einstein s celebrated paper on special relativity physical relativity is an unusual critical examination of the way einstein formulated his theory it also examines in detail certain specific historical and conceptual issues that have long given rise to debate in both special and general relativity theory such as the conventionality of simultaneity the principle of general covariance and the consistency or otherwise of the special theory with quantum mechanics harvey brown s new interpretation of relativity theory will interest anyone working on these central topics in modern physics

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