Relativity The Special And General Theory

Introduction to General Relativity, Black Holes, and CosmologyRelativity Simply ExplainedEinstein's Space-TimeSpecial and General RelativityFUNDAMENTALS OF SPECIAL AND GENERAL RELATIVITY, Revised EditionEinstein's Pathway to the Special Theory of RelativityGeneral RelativityEinstein's GenerationEssential RelativityThe Special And General TheorySpace-Time, Relativity, and CosmologyRelativityRelativity: The Theory and Its PhilosophyThe Road to RelativitySpecial Relativity, Electrodynamics, and General RelativityMathematical Theory of Special and General RelativityRelativitySpecial & General RelativityWhat Is Relativity?General Theory of RelativityThe Einstein Theory of RelativityIntroduction to General RelativityRelativityThe Principle of RelativityCosmological RelativityThe Genesis of General RelativityUnsolved Problems in Special and General RelativityRelativityEinstein's General Theory of RelativitySymmetry in Special and General RelativityA Student's Guide to General RelativityThe Routledge Guidebook to Einstein's RelativityA First Course in General RelativityGeneral RelativityRelativity - The Special and General TheoryThe Meaning of RelativityCore Principles of Special and General RelativityIntroduction to General RelativityRelativitySpecial Relativity in General Frames

Introduction to General Relativity, Black Holes, and Cosmology

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

Relativity Simply Explained

One of the subject's clearest, most entertaining introductions offers lucid explanations of special and general theories of relativity, gravity, and spacetime, models of the universe, and more. 100 illustrations.

Einstein's Space-Time

A Broad Perspective on the Theory of General Relativity and Its Observable ImplicationsGeneral Relativity: Basics and Beyond familiarizes students and beginning researchers with the basic features of the theory of general relativity as well as some of its more advanced aspects. Employing the pedagogical style of a textbook, it includes essential id

Special and General Relativity

Clarity, readability and rigor combine in the second edition of this widely-used textbook to provide the first step into general relativity for undergraduate students with a minimal background in mathematics. Topics within relativity that fascinate astrophysical researchers and students alike are covered with Schutz's characteristic ease and authority - from black holes to gravitational lenses, from

pulsars to the study of the Universe as a whole. This edition now contains discoveries by astronomers that require general relativity for their explanation; a revised chapter on relativistic stars, including new information on pulsars; an entirely rewritten chapter on cosmology; and an extended, comprehensive treatment of modern detectors and expected sources. Over 300 exercises, many new to this edition, give students the confidence to work with general relativity and the necessary mathematics, whilst the informal writing style makes the subject matter easily accessible. Password protected solutions for instructors are available at www.cambridge.org/9780521887052.

FUNDAMENTALS OF SPECIAL AND GENERAL RELATIVITY, Revised Edition

Einstein's general theory of relativity requires a curved space for the description of the physical world. If one wishes to go beyond superficial discussions of the physical relations involved, one needs to set up precise equations for handling curved space. The well-established mathematical technique that accomplishes this is clearly described in this classic book by Nobel Laureate P.A.M. Dirac. Based on a series of lectures given by Dirac at Florida State University, and intended for the advanced undergraduate, General Theory of Relativity comprises thirty-five compact chapters that take the reader point-by-point through the necessary steps

for understanding general relativity.

Einstein's Pathway to the Special Theory of Relativity

See the back of the book's cover for a description.

General Relativity

Albert Einstein is the unquestioned founder of modern physics. His theory of relativity is the most important scientific idea of the modern era. In this book Einstein explains, using the minimum of mathematical terms, the basic ideas and principles of the theory which has shaped the world we live in today. Unsurpassed by any subsequent books on relativity, this remains the most popular and useful exposition of Einstein's immense contribution to human knowledge. In this work Einstein intended, as far as possible, to give an exact insight into the theory of relativity to those readers who, from a general and scientific philosophical point of view, are interested in the theory, but who are not conversant with the mathematical apparatus of theoretical physics. The theory of relativity enriched physics and astronomy during the 20th century. (Relativity: The Special and the General Theory by Albert Einstein, 9789380914220)

Einstein's Generation

This book provides an accessible, yet thorough, introduction to special and general relativity, crafted and class-tested over many years of teaching. Suitable for advanced undergraduate and graduate students, this book provides clear descriptions of how to approach the mathematics and physics involved. It is also contains the latest exciting developments in the field, including dark energy, gravitational waves, and frame dragging. The table of contents has been carefully developed in consultation with a large number of instructors teaching courses worldwide, to ensure its wide applicability to modules on relativity and gravitation. Features: A clear, accessible writing style, presenting a sophisticated approach to the subject, that remains suitable for advanced undergraduate students and above Class-tested over many years To be accompanied by a partner volume on 'Advanced Topics' for students to further extend their learning

Essential Relativity

Relativity: The Theory and its Philosophy provides a completely self-contained treatment of the philosophical foundations of the theory of relativity. It also surveys the most essential mathematical techniques and concepts that are indispensable to an understanding of the foundations of both the special and

general theories of relativity. In short, the book includes a crash course in applied mathematics, ranging from elementary trigonometry to the classical tensor calculus. Comprised of 11 chapters, this book begins with an introduction to fundamental mathematical concepts such as sets, relations, and functions; N-tuples, vectors, and matrices; and vector algebra and calculus. The discussion then turns to the concept of relativity and elementary foundations of Newtonian mechanics, as well as the principle of special relativity and its interpretation by means of empiricism and rationalism. Subsequent chapters focus on the status of the doctrine of conventionalism in the theory of special relativity; the commensurability of classical and relativistic mechanics; mathematical foundations of special relativistic physics; and the classical or Newtonian theory of gravitation. The principle of general covariance and its relation to the principle of general relativity are also examined. The final chapter addresses the fundamental question as to the actual information concerning the structure of spacetime that is conveyed to us through the theory of general relativity. This monograph will be of interest to students, teachers, practitioners, and researchers in physics, mathematics, and philosophy.

The Special And General Theory

This book provides a concise introduction to both the special theory of relativity and the general theory of relativity. The format is chosen to provide the basis for a

single semester course which can take the students all the way from the foundations of special relativity to the core results of general relativity: the Einstein equation and the equations of motion for particles and light in curved spacetime. To facilitate access to the topics of special and general relativity for science and engineering students without prior training in relativity or geometry, the relevant geometric notions are also introduced and developed from the ground up. Students in physics, mathematics or engineering with an interest to learn Einstein's theories of relativity should be able to use this book already in the second semester of their third year. The book could also be used as the basis of a graduate level introduction to relativity for students who did not learn relativity as part of their undergraduate training.

Space-Time, Relativity, and Cosmology

Special Relativity, Electrodynamics, and General Relativity: From Newton to Einstein is intended to teach students of physics, astrophysics, astronomy, and cosmology how to think about special and general relativity in a fundamental but accessible way. Designed to render any reader a "master of relativity, all material on the subject is comprehensible and derivable from first principles. The book emphasizes problem solving, contains abundant problem sets, and is conveniently organized to meet the needs of both student and instructor. Fully revised and expanded second edition with improved figures Enlarged discussion of dynamics

and the relativistic version of Newton's second law Resolves the twin paradox from the principles of special and general relativity Includes new chapters which derive magnetism from relativity and electrostatics Derives Maxwell's equations from Gauss' law and the principles of special relativity Includes new chapters on differential geometry, space-time curvature, and the field equations of general relativity Introduces black holes and gravitational waves as illustrations of the principles of general relativity and relates them to the 2015 and 2017 observational discoveries of LIGO

Relativity

This book is based on a set of 18 class-tested lectures delivered to fourth-year physics undergraduates at Griffith University in Brisbane, and the book presents new discoveries by the Nobel-prize winning LIGO collaboration. The author begins with a review of special relativity and tensors and then develops the basic elements of general relativity (a beautiful theory that unifies special relativity and gravitation via geometry) with applications to the gravitational deflection of light, global positioning systems, black holes, gravitational waves, and cosmology. The book provides readers with a solid understanding of the underlying physical concepts; an ability to appreciate and in many cases derive important applications of the theory; and a solid grounding for those wishing to pursue their studies further. General Relativity: An Introduction to Black Holes, Gravitational Waves,

and Cosmology also connects general relativity with broader topics. There is no doubt that general relativity is an active and exciting field of physics, and this book successfully transmits that excitement to readers.

Relativity: The Theory and Its Philosophy

The Road to Relativity

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.

Special Relativity, Electrodynamics, and General Relativity

Publisher Description

Mathematical Theory of Special and General Relativity

Following the approach of Lev Landau and Evgenii Lifshitz, this book introduces the theory of special and general relativity with the Lagrangian formalism and the principle of least action. This method allows the complete theory to be constructed starting from a small number of assumptions, and is the most natural approach in modern theoretical physics. The book begins by reviewing Newtonian mechanics and Newtonian gravity with the Lagrangian formalism and the principle of least action, and then moves to special and general relativity. Most calculations are presented step by step, as is done on the board in class. The book covers recent advances in gravitational wave astronomy and provides a general overview of current lines of research in gravity. It also includes numerous examples and problems in each chapter.

Relativity

Vectors, tensors and functions -- Manifolds, vectors and differentiation -- Energy, momentum and Einstein's equations

Special & General Relativity

"In this chapter cosmological special relativity is extended to five dimensions by adding time to the three spatial dimensions and the velocity of the Hubble

expansion. As a consequence of this extension, equations of electrodynamics are considered through the extended skew-symmetric tensor, in which a new field is included along with the electric and magnetic fields. This new field is due to the Higgs interaction associated with the expansion of the Universe. It is unified with the electromagnetic interaction in the frame of cosmology. The field equations are developed in five dimensions. In addition to the well-known Maxwell equations new equations that describe the mix-up of different fields are obtained."--Publisher's website.

What Is Relativity?

An annotated facsimile edition of Einstein's handwritten manuscript on the foundations of general relativity This richly annotated facsimile edition of "The Foundation of General Relativity" introduces a new generation of readers to Albert Einstein's theory of gravitation. Written in 1915, this remarkable document is a watershed in the history of physics and an enduring testament to the elegance and precision of Einstein's thought. Presented here is a beautiful facsimile of Einstein's original handwritten manuscript, along with its English translation and an insightful page-by-page commentary that places the work in historical and scientific context. Hanoch Gutfreund and Jürgen Renn's concise introduction traces Einstein's intellectual odyssey from special to general relativity, and their essay "The Charm of a Manuscript" provides a delightful meditation on the varied afterlife of

Einstein's text. Featuring a foreword by John Stachel, this handsome edition also includes a biographical glossary of the figures discussed in the book, a comprehensive bibliography, suggestions for further reading, and numerous photos and illustrations throughout.

General Theory of Relativity

This four-volume work represents the most comprehensive documentation and study of the creation of general relativity. Einstein's 1912 Zurich notebook is published for the first time in facsimile and transcript and commented on by today's major historians of science. Additional sources from Einstein and others, who from the late 19th to the early 20th century contributed to this monumental development, are presented here in translation for the first time. The volumes offer detailed commentaries and analyses of these sources that are based on a close reading of these documents supplemented by interpretations by the leading historians of relativity.

The Einstein Theory of Relativity

The development of special and general relativity has relied significantly on ideas of symmetry. Similarly, modern efforts to test these theories have often sought

either violations or extensions of the symmetries seen, and symmetry is regularly used a tool in seeking new applications. In this Special Issue of symmetry, we explore some contemporary research related to symmetry in special and general relativity.

Introduction to General Relativity

Relativity is a triumph of the power of human thought and Einstein's greatest gift to mankind. It is a fascinating but difficult theory to understand. Mathematics is intimidating for a beginner. The popular books do not go into details of the subject and textbooks are just too hard for self-study. This book aims to bridge the gap between the two. The emphasis of this book is to explain the meaning and intuition behind concepts and mathematics. There is extensive use of analogies from daily life to develop visualization and intuition. This book is well suited for a beginner who has limited physics and mathematics background. The biggest barrier in learning relativity is the notation, which is a language onto itself. If the meaning behind notation is not clear, it's easy to get lost in the maze of indices used in relativity. This book tries to address the reason and meaning behind relativistic notation.

Relativity

This book introduces the general theory of relativity and includes applications to cosmology. The book provides a thorough introduction to tensor calculus and curved manifolds. After the necessary mathematical tools are introduced, the authors offer a thorough presentation of the theory of relativity. Also included are some advanced topics not previously covered by textbooks, including Kaluza-Klein theory, Israel's formalism and branes. Anisotropic cosmological models are also included. The book contains a large number of new exercises and examples, each with separate headings. The reader will benefit from an updated introduction to general relativity including the most recent developments in cosmology.

The Principle of Relativity

Originally published in 1916. PREFACE: The present book is intended, as far as possible, to give an exact insight into the theory of Relativity to those readers who, from a general scientific and philosophical point of view, are interested in the theory, but who are not conversant with the mathematical apparatus of theoretical physics. The work presumes a standard of education corresponding to that of a university matriculation examination, and, despite the shortness of the book, a fair amount of patience and force of will on the part of the reader.Many of the earliest books, particularly those dating back to the 1900's and before, are now extremely scarce and increasingly expensive. We are republishing these classic works in affordable, high quality, modern editions, using the original text and artwork.

Cosmological Relativity

Albert Einstein, one of the most prolific scientists of the twentieth century, developed the theory of relativity which was crucial for the advancement of modern physics. Young Einstein identified a paradox between Newtonian Mechanics and Maxwell's equations which pointed to a flawed understanding of space and time by the scientists of the day. In Relativity, Einstein presents his findings using a minimal amount of mathematical language, but the text can still be challenging for readers who lack an extensive scientific background. The Routledge Guidebook to Einstein's Relativity expands on and supplements this seminal text, by exploring: the historical context of Einstein's work and the background to his breakthroughs details of experimental verification of special and general relativity the enduring legacy of Einstein's theories and their implications for future scientific breakthroughs. This is an essential introduction for students of physics, philosophy and history in understanding the key elements of the work and the importance of this classic text to society today.

The Genesis of General Relativity

'Einstein's Generation' offers a new approach to the origins of modern physics by exploring both the material culture that stimulated relativity and the reaction of

Einstein's colleagues to his pioneering work.

Unsolved Problems in Special and General Relativity

Here are the 11 papers that forged the general and special theories of relativity: seven papers by Einstein, plus two papers by Lorentz and one each by Minkowski and Weyl. "A thrill to read again the original papers by these giants." — School Science and Mathematics. 1923 edition.

Relativity

Relativistic cosmology has in recent years become one of the most exciting and active branches of current research. In conference after conference the view is expressed that cosmology today is where particle physics was forty years ago, with major discoveries just waiting to happen. Also gravitational wave detectors, presently under construction or in the testing phase, promise to open up an entirely novel field of physics. The book's basic purpose is to make relativity come alive conceptually. Hence the emphasis on the foundations and the logical subtleties rather than on the mathematics or the detailed experiments per se.

Einstein's General Theory of Relativity

Introduction to General Relativity is an introductory text on the concepts and modes of calculation used in general relativity. Topics covered range from Newton's laws of motion and the Galilean transformation to tensor analysis, equations of motion of free particles, electromagnetism, and gravitational fields and waves. Solutions of the field equations are also given. The emphasis is on the actual performance of relativistic calculations, rather than on mathematical rigor or exhaustive completeness. This volume is comprised of nine chapters and begins with an overview of the theory of relativity, which includes special relativity and general relativity. The discussion then turns to Newton's laws of motion and the Galilean transformation, electromagnetism and the Galilean transformation, and the Lorentz transformation. Subsequent chapters explore tensor analysis; equations of motion of free particles; gravitational fields and waves; relativity in cosmology; and unified theories and quantized theories of general relativity. The final chapter is devoted to Minkowski's coordinates and orthogonal transformations. This book will be a valuable resource for students of physics.

Symmetry in Special and General Relativity

ÊHow better to learn the Special Theory of Relativity and the General Theory of Relativity than directly from their creator, Albert Einstein himself? In Relativity: The Special and the General Theory, Einstein describes the theories that made him famous, illuminating his case with numerous examples and a smattering of math

(nothing more complex than high-school algebra). Einstein's book is not casual reading, but for those who appreciate his work without diving into the arcana of theoretical physics, Relativity will prove a stimulating read. "The present book is intended," Einstein wrote in 1916, "as far as possible, to give an exact insight into the theory of Relativity to those readers who, from a general scientific and philosophical point of view, are interested in the theory, but who are not conversant with the mathematical apparatus of theoretical physics."

A Student's Guide to General Relativity

This text brings the challenge and excitement of modern relativity and cosmology at rigorous mathematical level within reach of advanced undergraduates and beginning graduates.

The Routledge Guidebook to Einstein's Relativity

This book pieces together the jigsaw puzzle of Einstein's journey to discovering the special theory of relativity. Between 1902 and 1905, Einstein sat in the Patent Office and may have made calculations on old pieces of paper that were once patent drafts. One can imagine Einstein trying to hide from his boss, writing notes on small sheets of paper, and, according to reports, seeing to it that the small

sheets of paper on which he was writing would vanish into his desk-drawer as soon as he heard footsteps approaching his door. He probably discarded many pieces of papers and calculations and flung them in the waste paper basket in the Patent Office. The end result was that Einstein published nothing regarding the special theory of relativity prior to 1905. For many years before 1905, he had been intensely concerned with the topic; in fact, he was busily working on the problem for seven or eight years prior to 1905. Unfortunately, there are no surviving notebooks and manuscripts, no notes and papers or other primary sources from this critical period to provide any information about the crucial steps that led Einstein to his great discovery. In May 1905, Henri Poincaré sent three letters to Hendrik Lorentz at the same time that Einstein wrote his famous May 1905 letter to Conrad Habicht, promising him four works, of which the fourth one, Relativity, was a rough draft at that point. In the May 1905 letters to Lorentz, Poincaré presented the basic equations of his 1905 "Dynamics of the Electron", meaning that, at this point, Poincaré and Einstein both had drafts of papers relating to the principle of relativity. The book discusses Einstein's and Poincaré's creativity and the process by which their ideas developed. The book also explores the misunderstandings and paradoxes apparent in the theory of relativity, and unravels the subtleties and creativity of Einstein.

A First Course in General Relativity

General Relativity

An astrophysicist offers an entertaining introduction to Einstein's theories, explaining how well they have held up to rigorous testing over the years, and even describing the amazing phenomena readers would actually experience if they took a trip through a black hole.

Relativity - The Special and General Theory

After completing the final version of his general theory of relativity in November 1915, Albert Einstein wrote a book about relativity for a popular audience. His intention was 'to give an exact insight into the theory of relativity to those readers who, from a general scientific and philosophical point of view, are interested in the theory, but who are not conversant with the mathematical apparatus of theoretical physics.' The book remains one of the most lucid explanations of the special and general theories ever written. In the early 1920s alone, it was translated into ten languages, and fifteen editions in the original German appeared over the course of Einstein's lifetime. The theory of relativity enriched physics and astronomy during the 20th century.

The Meaning of Relativity

General Relativity is a beautiful geometric theory, simple in its mathematical formulation but leading to numerous consequences with striking physical interpretations: gravitational waves, black holes, cosmological models, and so on. This introductory textbook is written for mathematics students interested in physics and physics students interested in exact mathematical formulations (or for anyone with a scientific mind who is curious to know more of the world we live in), recent remarkable experimental and observational results which confirm the theory are clearly described and no specialised physics knowledge is required. The mathematical level of Part A is aimed at undergraduate students and could be the basis for a course on General Relativity. Part B is more advanced, but still does not require sophisticated mathematics. Based on Yvonne Choquet-Bruhat's more advanced text, General Relativity and the Einstein Equations, the aim of this book is to give with precision, but as simply as possible, the foundations and main consequences of General Relativity. The first five chapters from General Relativity and the Einstein Equations have been updated with new sections and chapters on black holes, gravitational waves, singularities, and the Reissner-Nordstrom and interior Schwarzchild solutions. The rigour behind this book will provide readers with the perfect preparation to follow the great mathematical progress in the actual development, as well as the ability to model, the latest astrophysical and cosmological observations. The book presents basic General Relativity and provides a basis for understanding and using the fundamental theory.

Core Principles of Special and General Relativity

Summary: 'Space-Time, Relativity, and Cosmology' uses a historical perspective to describe the evolution of modern ideas about space and time. It is ideal for physics undergraduates and high-school students, non-science majors and general readers.

Introduction to General 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 gyrometers, 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)

Relativity

Special Relativity in General Frames

ROMANCE ACTION & ADVENTURE MYSTERY & THRILLER BIOGRAPHIES & HISTORY CHILDREN'S YOUNG ADULT FANTASY HISTORICAL FICTION HORROR LITERARY FICTION NON-FICTION SCIENCE FICTION