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General Relativity M. P. Hobson 2006-02-02 An advanced textbook providing a clear mathematical introduction to general relativity and its physical applications. *Essential Mathematical Methods for the Physical*

Sciences K. F. Riley 2011-02-17 The mathematical methods that physical scientists need for solving substantial problems in their fields of study are set out clearly and simply in this tutorial-style textbook. Students will develop p

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solving skills through hundreds of worked examples, self-test questions and homework problems. Each chapter concludes with a summary of the main procedures and results and all assumed prior knowledge is summarized in one of the appendices. Over 300 worked examples show how to use the techniques and around 100 self-test questions in the footnotes act as checkpoints to build student confidence. Nearly 400 end-of-chapter problems combine ideas from the chapter to reinforce the concepts. Hints and outline answers to the odd-numbered problems are given at the end of each chapter, with fully-worked solutions to these problems given in the accompanying Student Solutions Manual. Fully-worked solutions to all problems, password-protected for instructors, are available at www.cambridge.org/essential.

Numerical Relativity

Thomas W. Baumgarte
2010-06-24 Aimed at students and researchers entering the field, this pedagogical introduction to numerical relativity will also interest scientists seeking a broad survey of its challenges and achievements. Assuming only a basic knowledge of classical general relativity, the book develops the mathematical formalism from first principles, and then highlights some of the pioneering simulations involving black holes and neutron stars, gravitational collapse and gravitational waves. The book contains 300 exercises to help readers master new material as it is presented. Numerous illustrations, many in color, assist in visualizing new geometric concepts and highlighting the results of computer simulations. Summary boxes encapsulate some of the most important results for quick reference.

Applications covered

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include calculations of coalescing binary black holes and binary neutron stars, rotating stars, colliding star clusters, gravitational and magnetorotational collapse, critical phenomena, the generation of gravitational waves, and other topics of current physical and astrophysical significance.

Student Solution Manual for Foundation Mathematics for the Physical Sciences K. F. Riley 2011-03-28 This Student Solution Manual provides complete solutions to all the odd-numbered problems in *Foundation Mathematics for the Physical Sciences*. It takes students through each problem step-by-step, so they can clearly see how the solution is reached, and understand any mistakes in their own working. Students will learn by example how to arrive at the correct answer and improve their problem-solving skills.

Gravitation T. Padmanabhan 2010-01-28

Covering all aspects of gravitation in a contemporary style, this advanced textbook is ideal for graduate students and researchers in all areas of theoretical physics. The 'Foundation' section develops the formalism in six chapters, and uses it in the next four chapters to discuss four key applications - spherical spacetimes, black holes, gravitational waves and cosmology. The six chapters in the 'Frontier' section describe cosmological perturbation theory, quantum fields in curved spacetime, and the Hamiltonian structure of general relativity, among several other advanced topics, some of which are covered in-depth for the first time in a textbook. The modular structure of the book allows different sections to be combined to suit a variety of courses. Over 200 exercises are included to test and develop the reader's understanding.

There are also

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projects, which help readers make the transition from the book to their own original research.

Relativity Hans Stephani
2004-02-12 Publisher
Description

Introduction to General Relativity, Black Holes, and Cosmology Yvonne

Choquet-Bruhat
2015-01-21 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 Schwarzschild solutions. The rigour behind this book will provide readers with the perfect preparation to follow the great mathematical

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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.

Foundation Mathematics for the Physical Sciences K. F. Riley
2011-03-31 This tutorial-style textbook develops the basic mathematical tools needed by first and second year undergraduates to solve problems in the physical sciences. Students gain hands-on experience through hundreds of worked examples, self-test questions and homework problems. Each chapter includes a summary of the main results, definitions and formulae. Over 270 worked examples show how to put the tools into practice. Around 170 self-test questions in the footnotes and 300 end-of-section exercises give students an instant check of their

understanding. More than 450 end-of-chapter problems allow students to put what they have just learned into practice. Hints and outline answers to the odd-numbered problems are given at the end of each chapter. Complete solutions to these problems can be found in the accompanying Student Solutions Manual. Fully-worked solutions to all problems, password-protected for instructors, are available at www.cambridge.org/foundation.

300 Problems in Special and General Relativity Mattias Blennow
2021-12-09 Einstein's theories of special relativity and general relativity form a core part of today's undergraduate (or Masters-level) physics curriculum. This is a supplementary problem book or student's manual, consisting of 150 problems in each of special and general relativity. The problems, which have been developed

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and refined by the authors over the past two decades, are a mixture of short-form and multi-part extended problems, with hints provided where appropriate. Complete solutions are elaborated for every problem, in a different section of the book; some solutions include brief discussions on their physical or historical significance. Designed as a companion text to complement a main relativity textbook, it does not assume access to any specific textbook. This is a helpful resource for advanced students, for self-study, a source of problems for university teaching assistants, or as inspiration for instructors and examiners constructing problems for their lectures, homework or exams.

Maxwell-Dirac Theory and Occam's Razor András Kovács 2019-07 We introduce and use the space-time Clifford algebra, showing that only one fundamental

physical entity is sufficient to describe the origin of electromagnetic fields, charges and currents: the electromagnetic four-potential. The obtained electromagnetic Lagrangian is the simplest possible relativistic Lagrangian formulation.

Mathematical Physics Bruce R. Kusse 2010-01-05 What sets this volume apart from other mathematics texts is its emphasis on mathematical tools commonly used by scientists and engineers to solve real-world problems. Using a unique approach, it covers intermediate and advanced material in a manner appropriate for undergraduate students. Based on author Bruce Kusse's course at the Department of Applied and Engineering Physics at Cornell University, Mathematical Physics begins with essentials such as vector and tensor algebra, curvilinear coordinate systems, complex variables, Four

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series, Fourier and Laplace transforms, differential and integral equations, and solutions to Laplace's equations. The book moves on to explain complex topics that often fall through the cracks in undergraduate programs, including the Dirac delta-function, multivalued complex functions using branch cuts, branch points and Riemann sheets, contravariant and covariant tensors, and an introduction to group theory. This expanded second edition contains a new appendix on the calculus of variation -- a valuable addition to the already superb collection of topics on offer. This is an ideal text for upper-level undergraduates in physics, applied physics, physical chemistry, biophysics, and all areas of engineering. It allows physics professors to prepare students for a wide range of employment in science and engineering and makes an excellent reference for

scientists and engineers in industry. Worked out examples appear throughout the book and exercises follow every chapter. Solutions to the odd-numbered exercises are available for lecturers at www.wiley-vch.de/textbooks/.

Foundation Mathematics for the Physical Sciences K. F. Riley
2011-03-31 This tutorial-style textbook develops the basic mathematical tools needed by first and second year undergraduates to solve problems in the physical sciences. Students gain hands-on experience through hundreds of worked examples, self-test questions and homework problems. Each chapter includes a summary of the main results, definitions and formulae. Over 270 worked examples show how to put the tools into practice. Around 170 self-test questions in the footnotes and 300 end-of-section exercises give students an instant check of their

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A Short Course in General Relativity James A. Foster 2010-04-30
Suitable for a one-semester course in general relativity for senior undergraduates or beginning graduate students, this text clarifies the mathematical aspects of Einstein's theory of relativity without sacrificing physical understanding.
[Space, Time and Gravitation - An Outline of the General Relativity Theory](#) Arthur

Eddington 2013-04-16
Written by the English astrophysicist, Sir Arthur Eddington (1882-1944), and originally published in 1920, 'Space, Time and Gravitation' outlines the general theory of relativity in astrophysics. This fascinating early work navigates Einstein's theory through a series of perspectives - that of the experimental physicist, pure mathematician, and relativist, making it a wonderful read for the student, teacher or astrophysics enthusiast today. Contents include: Arthur Eddington; Preface; Prologue; 'What Is Geometry?'; 1 - The Fitzgerald Contraction; 2 - Relativity; 3 - The World of Four Dimensions; 4 - Fields of force; 5 - Kinds of Space; 6 - The New Law of Gravitation and the Old Law; 7 - Weighing Light; 8 - Other Tests of the Theory; 9 - Momentum and Energy; 10 - towards infinity; 11 - Electricity and Gravitation; 12

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Nature of Things;
Appendix; Mathematical
Notes; Historical Note.
This classic text is
being republished in a
modern and affordable
edition, complete with
reproductions of the
original illustrations
and a specially written
concise biography.
*A First Course in
General Relativity*
Bernard F. Schutz
1985-01-31 This textbook
develops general
relativity and its
associated mathematics
from a minimum of
prerequisites, leading
to a physical
understanding of the
theory in some depth.

**Mathematical Methods for
Physics and Engineering**

K. F. Riley 2006-03-13
The third edition of
this highly acclaimed
undergraduate textbook
is suitable for teaching
all the mathematics for
an undergraduate course
in any of the physical
sciences. As well as
lucid descriptions of
all the topics and many
worked examples, it
contains over 800
exercises. New stand-
alone chapters give a

systematic account of
the 'special functions'
of physical science,
cover an extended range
of practical
applications of complex
variables, and give an
introduction to quantum
operators. Further
tabulations, of
relevance in statistics
and numerical
integration, have been
added. In this edition,
half of the exercises
are provided with hints
and answers and, in a
separate manual
available to both
students and their
teachers, complete
worked solutions. The
remaining exercises have
no hints, answers or
worked solutions and can
be used for unaided
homework; full solutions
are available to
instructors on a
password-protected web
site,
www.cambridge.org/9780521679718.

**Problems for Physics
Students**

K. F. Riley
1982-11-25 A collection
of four hundred physics
problems chosen for
their stimulating
qualities and designed

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to aid advanced high school and first-year university physics and engineering students. Questions cover a wide range of subjects in physics and vary in difficulty.

Relativistic Cosmology
George F. R. Ellis
2012-03-22 Cosmology has been transformed by dramatic progress in high-precision observations and theoretical modelling. This book surveys key developments and open issues for graduate students and researchers. Using a relativistic geometric approach, it focuses on the general concepts and relations that underpin the standard model of the Universe. Part I covers foundations of relativistic cosmology whilst Part II develops the dynamical and observational relations for all models of the Universe based on general relativity. Part III focuses on the standard model of cosmology, including inflation, dark matter, dark energy,

perturbation theory, the cosmic microwave background, structure formation and gravitational lensing. It also examines modified gravity and inhomogeneity as possible alternatives to dark energy. Anisotropic and inhomogeneous models are described in Part IV, and Part V reviews deeper issues, such as quantum cosmology, the start of the universe and the multiverse proposal. Colour versions of some figures are available at www.cambridge.org/9780521381154.

Advanced Mechanics and General Relativity Joel Franklin 2010-07-08 Aimed at advanced undergraduates with background knowledge of classical mechanics and electricity and magnetism, this textbook presents both the particle dynamics relevant to general relativity, and the field dynamics necessary to understand the theory. Focusing on action extremization, the book develops

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structure and predictions of general relativity by analogy with familiar physical systems. Topics ranging from classical field theory to minimal surfaces and relativistic strings are covered in a homogeneous manner. Nearly 150 exercises and numerous examples throughout the textbook enable students to test their understanding of the material covered. A tensor manipulation package to help students overcome the computational challenge associated with general relativity is available on a site hosted by the author. A link to this and to a solutions manual can be found at www.cambridge.org/9780521762458.

A General Relativity

Workbook Thomas A. Moore
2015-03-06

Mathematics for Physics

Michael Stone 2009-07-09
An engagingly-written account of mathematical tools and ideas, this book provides a graduate-level introduction to the

mathematics used in research in physics. The first half of the book focuses on the traditional mathematical methods of physics - differential and integral equations, Fourier series and the calculus of variations. The second half contains an introduction to more advanced subjects, including differential geometry, topology and complex variables. The authors' exposition avoids excess rigor whilst explaining subtle but important points often glossed over in more elementary texts. The topics are illustrated at every stage by carefully chosen examples, exercises and problems drawn from realistic physics settings. These make it useful both as a textbook in advanced courses and for self-study. Password-protected solutions to the exercises are available to instructors at www.cambridge.org/9780521854030.

The Cosmic Spacetime Downloaded from
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Fulvio Melia 2020-11-03
The growth of cosmology into a precision science represents one of the most remarkable stories of the past century. Much has been written chronicling this development, but rarely has any of it focused on the most critical element of this work—the cosmic spacetime itself. Addressing this lacuna is the principal focus of this book, documenting the growing body of evidence compelling us—not only to use this famous solution to Einstein's equations in order to refine the current paradigm, but—to probe its foundation at a much deeper level. Its excursion from the smallest to largest possible scales insightfully reveals an emerging link between the Universe we behold and the established tenets of our most fundamental physical theories. Key Features: Uncover the critical link between the Local Flatness Theorem in general relativity and

the symmetries informing the spacetime's metric coefficients Develops a physical explanation for some of the most unpalatable coincidences in cosmology Provides a sober assessment of the horizon problems precluding our full understanding of the early Universe Reveals a possible explanation for the origin of rest-mass energy in Einstein's theory In spite of its technical layout, this book does not shy away from introducing the principal players who have made the most enduring contributions to this field. Anyone with a graduate level foundation in physics and astronomy will be able to easily follow its contents.

General Relativity

Robert M. Wald

2010-05-15 "Wald's book is clearly the first textbook on general relativity with a totally modern point of view; and it succeeds very well where others are only partially successful. The book includes full

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discussions of many problems of current interest which are not treated in any extant book, and all these matters are considered with perception and understanding."—S. Chandrasekhar "A tour de force: lucid, straightforward, mathematically rigorous, exacting in the analysis of the theory in its physical aspect."—L. P. Hughston, Times Higher Education Supplement "Truly excellent. . . . A sophisticated text of manageable size that will probably be read by every student of relativity, astrophysics, and field theory for years to come."—James W. York, Physics Today

A First Course in General Relativity

Bernard Schutz
2009-05-14 Second edition of a widely-used textbook providing the first step into general relativity for undergraduate students with minimal mathematical background.

General Relativity

Michael Paul Hobson 2006

Written for advanced undergraduate and graduate students, this is a clear mathematical introduction to Einstein's theory of general relativity and its physical applications. Concentrating on the theory's physical consequences, this approachable textbook contains over 300 exercises to illuminate and extend the discussion.

Problem Book in Relativity and Gravitation Alan P. Lightman

2017-09-01 An essential resource for learning about general relativity and much more, from four leading experts Important and useful to every student of relativity, this book is a unique collection of some 475 problems--with solutions--in the fields of special and general relativity, gravitation, relativistic astrophysics, and cosmology. The problems are expressed in broad physical terms to enhance their

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to readers with diverse backgrounds. In their solutions, the authors have attempted to convey a mode of approach to these kinds of problems, revealing procedures that can reduce the labor of calculations while avoiding the pitfall of too much or too powerful formalism. Although well suited for individual use, the volume may also be used with one of the modern textbooks in general relativity.

Relativity, Gravitation and Cosmology Robert J. Lambourne 2010-06 The textbook introduces students to basic geometric concepts, such as metrics, connections and curvature, before examining general relativity in more detail. It shows the observational evidence supporting the theory, and the description of general relativity provides of black holes and cosmological spacetimes. --

Student Solution Manual for Mathematical Methods for Physics and Engineering Third

Edition K. F. Riley 2006-03-06 Solutions manual contains complete worked solutions to half of the problems in *Mathematical Methods for Physics and Engineering, Third Edition*.

Physical Mathematics Kevin Cahill 2013-03-14 Unique in its clarity, examples and range, *Physical Mathematics* explains as simply as possible the mathematics that graduate students and professional physicists need in their courses and research. The author illustrates the mathematics with numerous physical examples drawn from contemporary research. In addition to basic subjects such as linear algebra, Fourier analysis, complex variables, differential equations and Bessel functions, this textbook covers topics such as the singular-value decomposition, Lie algebras, the tensors and forms of general relativity, the central limit theorem and Kolmogorov test of statistics, the

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Carlo methods of experimental and theoretical physics, the renormalization group of condensed-matter physics and the functional derivatives and Feynman path integrals of quantum field theory.

Relativity, Gravitation and Cosmology Ta-Pei Cheng 2010-01 This book provides an introduction to Einstein's general theory of relativity. A "physics-first" approach is adopted so that interesting applications come before the more difficult task of solving the Einstein equation. The book includes extensive coverage of cosmology, and is designed to allow readers to study the subject alone.

Mathematics for the Physical Sciences James B. Seaborn 2012-12-06 The book provides a bridge from courses in general physics to the intermediate-level courses in classical mechanics, electrodynamics and quantum mechanics. The author bases the mathematical discussions

on specific physical problems to provide a basis for developing mathematical intuition.

Advanced General Relativity John Stewart 1993-11-26 A self-contained introduction to advanced general relativity.

General Relativity N.M.J. Woodhouse 2007-03-06 Based on a course taught for years at Oxford, this book offers a concise exposition of the central ideas of general relativity. The focus is on the chain of reasoning that leads to the relativistic theory from the analysis of distance and time measurements in the presence of gravity, rather than on the underlying mathematical structure. Includes links to recent developments, including theoretical work and observational evidence, to encourage further study.

Relativity Wolfgang Rindler 2006-04-06 This text brings the challenge and excitement of modern relativity and

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cosmology at rigorous mathematical level within reach of advanced undergraduates and beginning graduates.

Student Solution Manual for Essential

Mathematical Methods for the Physical Sciences K.

F. Riley 2011-02-17 This Student Solution Manual provides complete solutions to all the odd-numbered problems in Essential Mathematical Methods for the Physical Sciences. It takes students through each problem step-by-step, so they can clearly see how the solution is reached, and understand any mistakes in their own working. Students will learn by example how to select an appropriate method, improving their problem-solving skills. *Gravitation* Charles W.

Misner 2017-10-24 Spacetime physics -- Physics in flat spacetime -- The mathematics of curved spacetime -- Einstein's geometric theory of gravity -- Relativistic stars -- The universe -- Gravitational collapse and black holes --

Gravitational waves -- Experimental tests of general relativity -- Frontiers

A Student's Manual for A First Course in General Relativity

Gravity from the Ground Up Bernard Schutz

2003-12-04 This book invites the reader to understand our Universe, not just marvel at it. From the clock-like motions of the planets to the catastrophic collapse of a star into a black hole, gravity controls the Universe. Gravity is central to modern physics, helping to answer the deepest questions about the nature of time, the origin of the Universe and the unification of the forces of nature. Linking key experiments and observations through careful physical reasoning, the author builds the reader's insight step-by-step from simple but profound facts about gravity on Earth to the frontiers of research. Topics covered include the nature of stars and galaxies, the myste

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of dark matter and dark energy, black holes, gravitational waves, inflation and the Big Bang. Suitable for general readers and for undergraduate courses, the treatment uses only high-school level mathematics, supplemented by optional computer programs, to explain the laws of physics governing gravity.

Introduction to General Relativity Lewis Ryder
2009-06-11 Student-friendly, well illustrated textbook for advanced undergraduate and beginning graduate students in physics and mathematics.

Physics Art Hobson
2010-02 This edition features the exact same content as the traditional text in a

convenient, three-hole-punched, loose-leaf version. Books à la Carte also offer a great value—this format costs 35% less than a new textbook. Written for the non-science major, this text emphasizes modern physics and the scientific process—and engages you by drawing connections between physics and everyday experience. Hobson takes a conceptual approach, with an appropriate focus on quantitative skills. The Fifth Edition increases coverage of key environmental topics such as global warming and energy, and adds new topics such as momentum. Hobson's text remains the least expensive textbook available for students taking nonmajors physics.