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Relativity, either special or general, has a reputation for being a little difficult and counter-intuitive. Being titled "Advanced," it

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might seem as if this is the last book a person should approach. Well, it isn't. A main difficulty in learning general relativity is the need to do differential geometry.

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The general principle of relativity states that the laws of physics are invariant under an arbitrary - but invertible - coordinate transformation $x^\mu \rightarrow x'^\mu = x^\mu(x')$ (1.6) under which we have that ds^2 is invariant. The same calculation as above leads to $ds^2 = g_{\mu\nu} dx^\mu dx^\nu$ (1.7) = $g'_{\alpha\beta} dx'^\alpha dx'^\beta$ (1.8) = $g_{\mu\nu} \frac{\partial x^\mu}{\partial x'^\alpha} \frac{\partial x^\nu}{\partial x'^\beta} dx'^\alpha dx'^\beta$ (1.9)

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Advanced Lectures on General Relativity

Advanced Lectures on General Relativity. These lecture notes are intended for starting PhD students in theoretical physics who have a working knowledge of General Relativity. The 4 topics covered are (1) Surface charges as conserved quantities in theories of gravity; (2) Classical and holographic features of three-dimensional Einstein gravity; (3) Asymptotically flat spacetimes in 4 dimensions: BMS group and memory effects; (4) The Kerr black hole: properties at extremality and quasi-normal ...

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General relativity, also known as the general theory of relativity, is the geometric theory of gravitation published by Albert Einstein in 1915 and is the current description of gravitation in modern physics. General relativity generalizes special relativity and refines Newton's law of universal gravitation, providing a unified description of gravity as a geometric property of space and time or ...

General relativity - Wikipedia

Tests of general relativity serve to establish observational evidence

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for the theory of general relativity. The first three tests, proposed by Albert Einstein in 1915, concerned the "anomalous" precession of the perihelion of Mercury, the bending of light in gravitational fields, and the gravitational redshift. The precession of Mercury was already known; experiments showing light bending in accordance with the predictions of general relativity were performed in 1919, with increasingly ...

Tests of general relativity - Wikipedia

Cambridge University Press, Nov 26, 1993 - Science - 240 pages. 1 Review. A modern self-contained introduction to key topics in advanced general relativity. The opening chapter reviews the subject,...

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The module consists of three topics in advanced general relativity, of 6 lectures each. At the end of the module, a student will know and understand the key ideas of each topic and be able to solve unseen problems using these methods. They will also have an appreciation of the wider context and significance of the content.

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VIII. General Relativity: Einstein's Theory of Gravity. Detailed course outline . General Comments. 8.20 is an introduction to Einstein's Special Theory of Relativity. We will probably have a lecture or two to introduce his General Theory as well, but the principal focus will be on special relativity, which we will study in quite a bit of detail.

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Syllabus | Introduction to Special Relativity | Physics ...

Advanced General Relativity. Eric Poisson - AGR grad course .

Advanced General Relativity - Lecture 27. Wednesday Apr 18, 2012. Speaker(s): Eric Poisson (MP4 Medium Res, MP4 Low Res, MP3, PDF) Collection/Series: Advanced General Relativity .

Advanced General Relativity - Lecture 24.

Advanced General Relativity | Perimeter Institute

Advanced General Relativity, by John Stewart, Cambridge, 1990.

This book has 2 chapters on advanced aspects of some mathematics that is useful in relativity, namely some modern approaches to tensor theory (also known in that case as differential geometry), and a very good approach to spinors.

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A self-contained introduction to advanced general relativity.

These lecture notes are intended for starting PhD students in theoretical physics who have a working knowledge of General Relativity. The four topics covered are: Surface charges as conserved quantities in theories of gravity; Classical and holographic features of three-dimensional Einstein gravity; Asymptotically flat spacetimes in four dimensions: BMS group and memory effects; The Kerr black hole: properties at extremality and quasi-normal mode ringing. Each topic starts with historical foundations and points to a few modern research directions.

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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 the 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

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and to a solutions manual can be found at
www.cambridge.org/9780521762458.

The book covers mainstream topics at research level involving gravitational waves, spinning particles, and black holes, suitable for graduates and early postgraduates exploring avenues into research in general relativity.

The domain of application of Einstein's general relativity theory is astronomical systems. One of the mathematical methods analyzed and exploited in the present volume is an extension of Noether's fundamental principle connecting symmetries to conserved quantities. This book is intended for advanced students and researchers seeking an introduction into the methods and

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applications of general relativity.

"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 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*

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This textbook is suitable for a one-semester introduction to General Relativity for advanced undergraduates in physics and engineering. The book is concise so that the entire material can be covered in the one-semester time frame. Many of the calculations are done in detail, without difficult mathematics, to help the students. Though concise, the theory development is lucid and the readers are exposed to possible analytic calculations. In the second edition, the famous twin paradox with acceleration is solved in full from the accelerated observer's frame. The findings of the Event Horizon Telescope (EHT) collaboration, who captured the first ever image of a black hole, are discussed in detail. The geodesic and frame drag

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precessions of gyroscopes in orbit about a rotating Earth are worked out and the Gravity Probe B (GPB) experiment is discussed. Also in the second edition are some new exercise problems. Resources are provided to instructors who adopt this textbook for their courses. Adopting instructors can print and copy portions of these resources solely for their teaching needs. All instructional resources are furnished for informational use only, and are subject to change without notice.

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

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problems are expressed in broad physical terms to enhance their pertinence 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.

These lecture notes are intended for starting PhD students in theoretical physics who have a working knowledge of General Relativity. The four topics covered are: Surface charges as conserved quantities in theories of gravity; Classical and holographic features of three-dimensional Einstein gravity; Asymptotically flat spacetimes in four dimensions: BMS group and

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