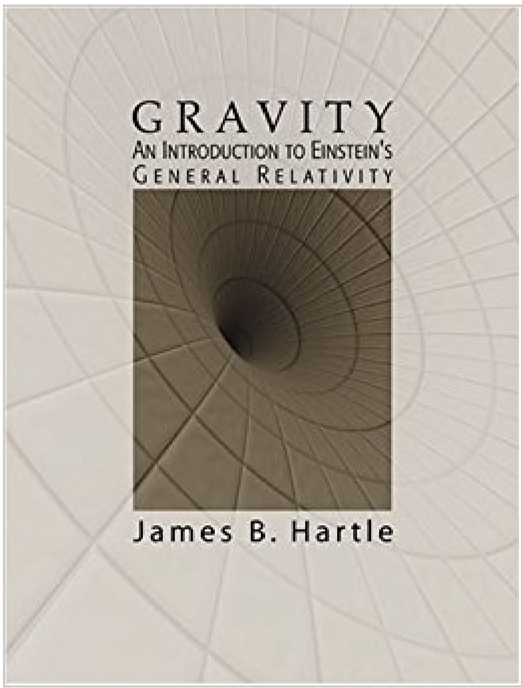
Gravity: An Introduction To Einstein's General Relativity



Synopsis

The aim of this groundbreaking new book is to bring general relativity into the undergraduate curriculum and make this fundamental theory accessible to all physics majors. Using a "physics first" approach to the subject, renowned relativist James B. Hartle provides a fluent and accessible introduction that uses a minimum of new mathematics and is illustrated with a wealth of exciting applications. The emphasis is on the exciting phenomena of gravitational physics and the growing connection between theory and observation. The Global Positioning System, black holes, X-ray sources, pulsars, quasars, gravitational waves, the Big Bang, and the large scale structure of the universe are used to illustrate the widespread role of how general relativity describes a wealth of everyday and exotic phenomena.

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Customer Reviews

The aim of this groundbreaking new book is to bring general relativity into the undergraduate curriculum and make this fundamental theory accessible to all physics majors. Using a "physics first" approach to the subject, renowned relativist James B. Hartle provides a fluent and accessible introduction that uses a minimum of new mathematics and is illustrated with a wealth of exciting applications. The emphasis is on the exciting phenomena of gravitational physics and the growing connection between theory and observation. The Global Positioning System, black holes, X-ray sources, pulsars, quasars, gravitational waves, the Big Bang, and the large scale structure of the universe are used to illustrate the widespread role of how general relativity describes a wealth of everyday and exotic phenomena.

James B. Hartle was educated at Princeton University and the California Institute of Technology where he completed a Ph.D. in 1964. He is currently Professor of Physics at the University of California, Santa Barbara. His scientific work is concerned with the application of Einstein’s relativistic theory of gravitation (general relativity) to realistic astrophysical situations, especially cosmology. Professor Hartle has made important contributions to the understanding of gravitational waves, relativistic stars, and black holes. He is currently interested in the earliest moments of the Big Bang where the subjects of quantum mechanics, quantum gravity, and cosmology overlap. He has visited Cambridge often since 1971 and has collaborated closely with Stephen Hawking over many years, most notably on their famous "no boundary proposal" for the origin of the universe. Professor Hartle is a member of the U.S. National Academy of Sciences, a fellow of the American Academy of Arts and Sciences, and is a past director of the Institute for Theoretical Physics in Santa Barbara.

I’m studying GR on my own because it’s so interesting and I’m an amateur Astronomer. I really love this book. It’s just right for me, though can still be a challenge when it comes to Tensors etc. I’m a software engineer, pretty good with math, but not a physicist. I heartily recommend this book to anyone motivated to better understand Gravity and General Relativity. The author doesn’t drop GR on you without tons of excellent preparation. The Einstein Equation doesn’t even show up until PART III, after all the prerequisites, and when he does explain it, he does it very well with both words and equations in an excellent balance.I also have a two books from the 70s: MTW ("Gravitation" by Wheeler, Thorne, and Miser) which is colorful and entertaining and has many terrific diagrams, but it’s huge, heavy, and a bit overwhelming for self study. Weinberg’s "Gravitation and Cosmology" is very different than MTW, hardly an illustration in the whole book, pretty dense math, less focused on Geometry... but it’s a classic and it’s nice to try another perspective, but it’s also harder to learn from, IMHO. I probably shouldn’t compare these two with modern textbooks, but I wanted to mention these classics.Hartle’s book is modern and definitely easier to learn from than the books mentioned above. I’m not sure how it compares to Schutz or Wald, but I can say this book is just right for anyone with decent a math background, and the necessary focus, interest, and motivation. Heck you could probably skip the math and still get a lot out of it.I’ll also mention "Exploring Black Holes: Introduction to General Relativity", a workbook from Taylor, Wheeler, et al, which I picked some years ago has been helpful and interesting. It walks through examples, such as the Advance of the Perihelion of Mercury etc. I just ordered Zee’s "Gravity in a Nutshell" and "A

Most Incomprehensible Thing" by Peter Collier... I heard they're very good. I'm not sure I want to spend $150 on Carroll's GR book, though I really like his lectures and audiobooks. Textbooks are selling for crazy money these days. Not sure who can afford to go to college anymore!Big thumbs up for this book!

An excellent introduction to general relativity: it's well written, all the ideas are explained at an intuitive level and with an easy-to-understand language; furthermore no mathematical prerequisites of high level are requested.In particular, a first part is a review of special relativity: a not so brief and very good summary, useful to understand the use of the 4-vector notation, too. A successive part is committed to the general relativity foundations (the way which Einstein developed the idea in), the mathematical structure and the analysis of many observations (such as gravitational lensing, cosmic microwave background radiation, universe expansion, etc.) that give confirmations of the theory (with an additional introduction to some cosmological models). A final part is committed to Einstein equation: tensor analysis, curvature, covariant derivative are introduced at this point, and you'll be got up enough to understand all the concepts.Very good binding and hardcover: it's durable and solid, with a good value for money.

When considering the purchase of a textbook, I read reviews carefullyand consider these opinions a valuable aid to separating the wheat fromthe chaff. I am studying and taking courses in general relativity andfound the reviews of books by Peter Collier, Bernard Schutz, SeanCarroll, and others to be helpful and accurate.Hartle really cares about correcting errors. His home site maintains anonline list of typos and corrections to his textbook.Two reviewers of Hartle's textbook made negative statements which areunjustified. My opinion is that Hartle's book is superb for self-studyand ranks alongside the seminal textbooks of Schutz and Carroll. Supportfor this statement is provided by Hartle's Chapter 2. In thisintroductory chapter on the geometry of physics, one can learn how tomeasure the curvature of space, how the Boomerang experiment found theuniverse to be flat, even how to construct a Mercator projection of a2-sphere, all in 17 pages.Hartle's textbook is distinguished by its "just in time" approach totensors. Collier's amazing book is intended for the beginner without abackground in mathematics. Carroll's textbook is unique for itslaser-like ability to focus on what is important.

I used this book for my Relativity & Black Holes course at UCI, an upper-division undergrad intro to SR & GR. The book uses an experimental approach by leading with observations and consequences of the equations of relativity without rigorous derivation. This is counter to the standard approach in physics, which is usually to derive the equations of motion, then move on to application and comparison to observation. If you're a math grad eager to apply your knowledge of differential geometry/topology then this is not the book for you're looking for. It is designed for advanced undergrad physicists to get a handle on the ideas and consequences of Einsteins theory before considering the very mathematically complicated derivations. The problems are incredibly challenging and solutions are not easy to come by. This textbook is definitely a keeper.