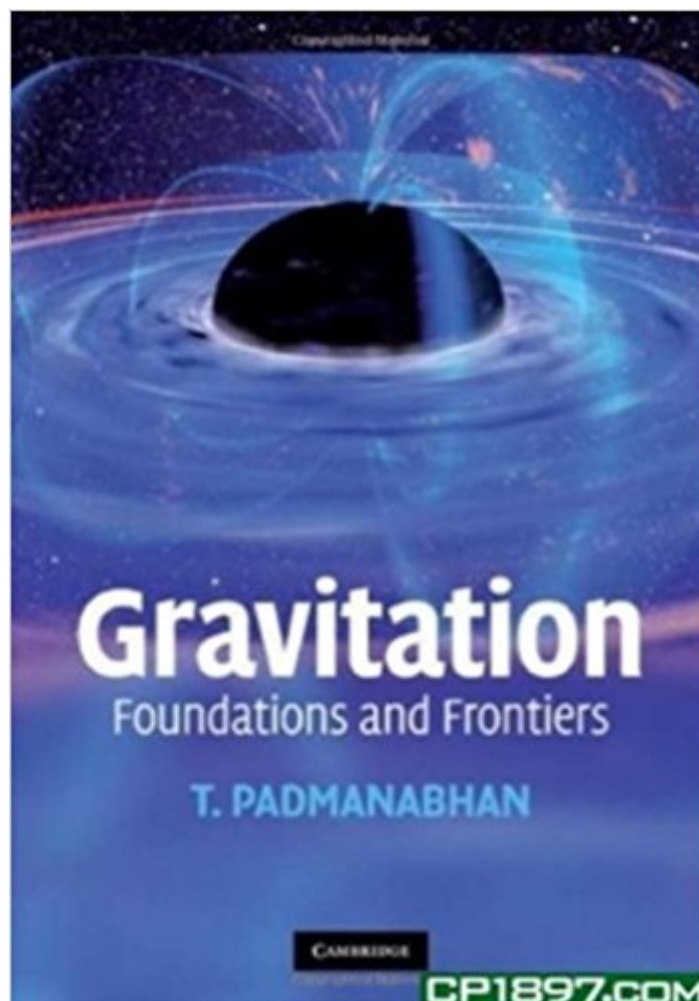


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# Gravitation: Foundations And Frontiers



## Synopsis

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 over 30 projects, which help readers make the transition from the book to their own original research.

## Book Information

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## Customer Reviews

"This book is immensely impressive. It is full of insights and derivations that do not appear in other books. The serious student will appreciate the extensive coverage of advanced topics, notably of actions. One might say, the book is action-packed." Andrew J. S. Hamilton, Professor of Astrophysics, University of Colorado, Boulder  
"The book is well written throughout and presents its material with admirable clarity and patience. It contains many topics that are not easily found in other relativity textbooks, at least not in the detail presented here. These include the relevance of surface terms for the variational principle, the classification of spacetime curvature, a contemporary presentation of the energy-momentum pseudotensor, and the treatment of cosmological

perturbations. The book is a valuable contribution to the textbook literature on general relativity and will remain up-to-date for many years to come. It contains 225 exercises (without solutions), many of them highly original, and presents thirty projects that can be used to build a bridge between the exercise level and research work at the level of a master thesis and beyond. It is certainly not possible to cover the whole material in a 1-year course, but its modular structure enables the lecturer to make the selection that is needed for his or her purpose. I plan to use and test the book myself in my next course on relativity and cosmology." General Relativity and Gravitation"Every topic is extremely well referenced and current ... This book is likely to be an essential reference for any galaxy-formation-research student or professor. In the coming years I can see myself dipping into this treasure trove on a very regular basis." Shaun Cole, The Observatory

Covering all aspects of gravitation in a contemporary style, this advanced textbook is ideal for graduate students and researchers. Its modular structure allows different sections to be combined to suit a variety of courses. There are more than 200 exercises and over 30 in-depth projects.

Really good...No, excellent indeed. If you want to know why gravity is constructed in the way it is and how from a very few principles, this is your book. I've never seen this detailed, rigorous and clear presentation of General Relativity.

It's surprising this book hasn't received any reviews here. This is possibly one of the finest general relativity textbooks existing today. Superbly modern in its exposition of the general relativity. If you're asking why the IRF moves on geodesics, you'll find the answer to that here. If you're wondering why the relativistic Lagrangian is integral of  $mc^2 ds$ , you'll find the answer to that here, rather than shady arguments used in other books. Practically everything here is derived from variational principles, so GR just feels so natural. It's hard to believe that GR could even be thought of in such an eye-opening way. I can only imagine what a good expositor Professor Padmanabhan is like in real life. The Pros of the book: \*The most illuminating problems and projects not present in any other book.\* Clear, concise writing and conceptual detail \*Covers modern topics like QFT in curved spacetime (I haven't gotten here yet though) \*Gives an introduction to the formulation of GR using differential forms \*The only prerequisites are some analytical mechanics at the level of Goldstein, some basic electrodynamics, and some special relativity. He doesn't even assume any familiarity with 4 vectors. However, a prior acquaintance with GR would be good to have, I learnt my GR the first time with Hobson, Efstathiou and Lasenby, and then moved to this. \*Almost no

typos. The Cons: \*Cosmology section is very brief and this could have been expanded greatly. This was disappointing and it felt like a stumble in the book. Then again, this is hardly an issue considering the entire book. In all, this book is pure gold. If 6 stars were available, I'd give it that.

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