General Relativity and the Einstein Equations [

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Oxford University Press, 2009

Electronic books

Monografía

Aimed at researchers in mathematics and physics, this monograph, in which the author overviews the basic ideas in General Relativity, introduces the necessary mathematics and discusses some of the key open questions in the field. - ;General Relativity has passed all experimental and observational tests to model the motion of isolated bodies with strong gravitational fields, though the mathematical and numerical study of these motions is still in its infancy. It is believed that General Relativity models our cosmos, with a manifold of dimensions possibly greater than four and debatable topology

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Título: General Relativity and the Einstein Equations electronic resource]

Editorial: Oxford Oxford University Press 2009

Descripción física: 1 online resource (812 p.)

Variantes del título: Oxford mathematical monographs

Mención de serie: Oxford Mathematical Monographs

Nota general: Description based upon print version of record

Bibliografía: Includes bibliographical references and index

Contenido: CONTENTS; I: Lorentz geometry; 1 Introduction; 2 Manifolds; 3 Differentiable mappings; 4 Vectors and tensors; 4.1 Tangent and cotangent space; 4.2 Vector fields; 4.3 Tensors and tensor fields; 5 Pseudo-Riemannian metrics; 5.1 General properties; 5.2 Riemannian and Lorentzian metrics; 6 Riemannian connection; 7 Geodesics; 8 Curvature; 9 Geodesic deviation; 10 Maximum of length and conjugate points; 11 Linearized Ricci and Einstein tensors; 12 Second derivative of the Ricci tensor; II: Special Relativity; 1 Newton's mechanics; 1.1 The Galileo-Newton spacetime 1.2 Newton's dynamics - the Galileo group2 Maxwell's equations; 3 Minkowski spacetime; 3.1 Definition; 3.2 Maxwell's equations on M[sub(4)]; 4 Poincaré group; 5 Lorentz group; 5.1 General formulae; 5.2 Transformation of electric and magnetic vector fields (case n = 3); 5.3 Lorentz contraction and dilatation; 6 Special Relativity; 6.1 Proper time; 6.2 Proper frame and relative velocities; 7 Dynamics of a pointlike mass; 7.1 Newtonian law; 7.2 Relativistic law; 7.3 Equivalence of mass and energy; 8 Continuous matter; 8.1 Case of dust (incoherent matter); 8.2 Perfect fluids III: General relativity and Einstein's equations1 Introduction; 2 Newton's gravity law; 3 General relativity; 3.1 Physical motivations; 4 Observations and experiments; 4.1