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Nota di contenuto	Contents; Preface; Constants; Fundamental constants; Conversion constants; Astronomical constants; Notation; 1 Newton's gravitational theory; 1.1 The law of universal gravitation; 1.2 Tests of the inverse-square law; 1.3 Gravitational potential; 1.4 Gravitational multipoles; quadrupole moment of the Sun; 1.5 Inertial and gravitational mass; 1.6 Tests of equality of gravitational and inertial mass; 1.7 Tidal forces; 1.8 Tidal field as a local measure of gravitation; Problems; 2 The formalism of special relativity; 2.1 The spacetime of special relativity; 2.2 Tensors in spacetime 2.3 Tensor fields 2.4 Energy-momentum tensor; 2.5 Relativistic electrodynamics; 2.6 Differential forms and exterior calculus; Problems; 3 The linear approximation; 3.1 The example of electromagnetism; 3.2 Linear field equations for gravitation; 3.3 Variational principle and equation of motion; 3.4 Nonrelativistic limit and Newton's theory; 3.5 Geometric interpretation; curved spacetime; Problems; 4 Applications

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4.6 Optics of gravitational lenses 4.7 Field of a rotating mass; Lense-Thirring effect; Problems; 5 Gravitational waves; 5.1 Plane waves; 5.2 Interaction of particles with a gravitational wave; 5.3 Emission of gravitational radiation; 5.4 Emission by a vibrating quadrupole; 5.5 Emission by a rotating quadrupole; 5.6 Emission of bursts of gravitational radiation; 5.7 Detectors of gravitational radiation; Problems; 6 Riemannian geometry; 6.1 General coordinates and tensors; 6.2 Parallel transport; covariant derivative; 6.3 Geodesic equation; 6.4 Metric tensor; 6.5 Riemann curvature tensor  
6.6 Geodesic deviation and tidal forces Fermi-Walker transport; 6.7 Differential forms in curved spacetime; 6.8 Isometries of spacetime; Killing vectors; Problems; 7 Einstein's gravitational theory; 7.1 General covariance and invariance; gauge transformations; 7.2 Einstein's field equation; 7.3 Another approach to Einsteins equation; cosmological term; 7.4 Schwarzschild solution and Birkhoff theorem; 7.5 Motion of planets; perihelion precession; 7.6 Propagation of light; gravitational redshift; 7.7 Geodetic precession; Problems; 8 Black holes and gravitational collapse  
8.1 Singularities and pseudosingularities 8.2 The black hole and its horizon; 8.3 Maximal Schwarzschild geometry; 8.4 Kerr solution and Reissner-Nordström solution; 8.5 Horizons and singularities of the rotating black hole; 8.6 Maximal Kerr geometry; 8.7 Black-hole thermodynamics; Hawking process; 8.8 Gravitational collapse and formation of black holes; 8.9 In search of black holes; Problems; 9 Cosmology; 9.1 Large-scale structure of the universe; 9.2 Cosmic distances; 9.3 Expansion of the universe; Hubble's law; 9.4 Age of the universe; 9.5 Cosmic background radiation; 9.6 Mass density dark mass

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### Sommario/riassunto

The third edition of this classic textbook is a quantitative introduction for advanced undergraduates and graduate students. It gently guides students from Newton's gravitational theory to special relativity, and then to the relativistic theory of gravitation. General relativity is approached from several perspectives: as a theory constructed by analogy with Maxwell's electrodynamics, as a relativistic generalization of Newton's theory, and as a theory of curved spacetime. The authors provide a concise overview of the important concepts and formulas, coupled with the experimental results underpinning the latest research in the field. Numerous exercises in Newtonian gravitational theory and Maxwell's equations help students master essential concepts for advanced work in general relativity, while detailed spacetime diagrams encourage them to think in terms of four-dimensional geometry. Featuring comprehensive reviews of recent experimental and observational data, the text concludes with chapters on cosmology and the physics of the Big Bang and inflation.

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