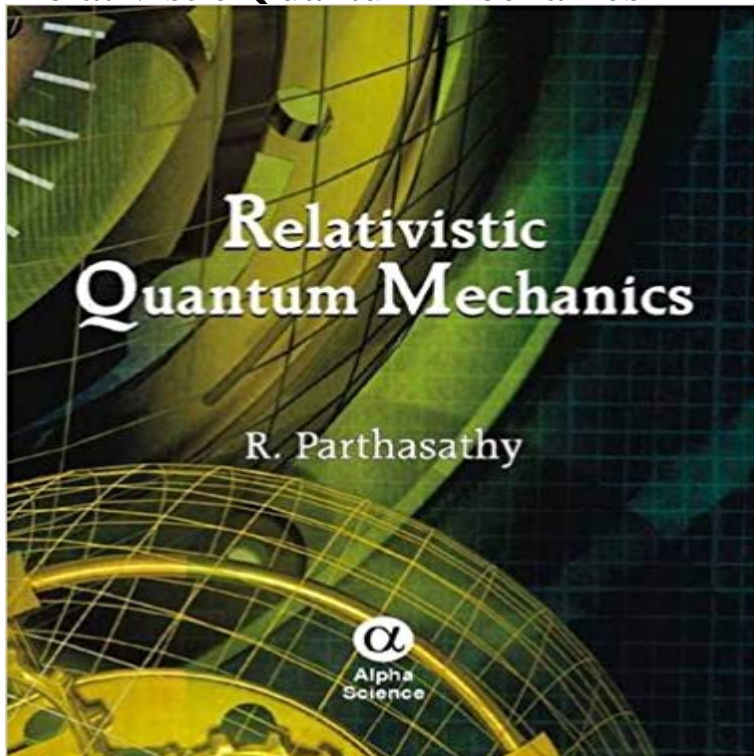


# Relativistic Quantum Mechanics



Relativistic Quantum Mechanics begins with the Klein-Gordon equation describing its features and motivating the need for a correct relativistic equation for the electron. It then introduces the Dirac equation by linearizing the second order relativistic equation which reveals the spin, spin magnetic moment and the spin-orbit coupling of the electron. After demonstrating the relativistic covariance of the Dirac equation, the discrete transformations of the Dirac spinor, are explained. The Dirac equation for a free electron and an electron in hydrogen atom are solved these solutions are used to interpret the negative energy states in the hole theory of Dirac. As applications of the Dirac equation, the scattering of electrons by a Coulomb potential is given in detail and extended to electron-proton scattering. As a further application, the Dirac equation with zero mass is considered to describe the neutrino. The chapter on neutrinos contains a brief description of neutrino oscillations. The book ends with giving an elementary treatment of spin manifolds with illustrative examples.

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