In the present work, we study some aspects of Einstein's theory of gravitation in general spacetimes with an arbitrary number of dimensions. In the first chapter we summarize the foundations of used geometric formalism and we derive the equation of goedesic deviation representing the relation between relative acceleration and the Riemann tensor. Second chapter presents different types of algebraic classification of the Weyl tensor in four and higher dimensions. Third chapter is devoted to a detailed examination of the test particle motions and also to the interpretation of different terms in the general equation of geodesic deviation. The fourth section examines appropriate choice of the interpretation frame and the coordinates. The final fifth chapter contains an analysis of the motion of test particles in the Robinson-Trautman spacetime with an arbitrary higher number of dimensions.