We discuss some classes of portfolio optimization problems treated through various portfolio optimization models. Most basic portfolio optimization problems are based on mean-variance optimization models corresponding to return and risk preferences of the investor. These mathematical portfolio optimization problems are either the quadratic programming or linear parametric programming problems. Besides the return and risk preferences there could be other preferences of the investor based on more important criteria such as transaction costs. The extensions of the classical mean-variance portfolio optimization model have been proposed by considering alternative measures of risk and many realistic criteria other than the return and risk in order to arrive at better financial decisions. Furthermore, to deal with uncertainty, the major emphasis has been given to fuzzy set theory concepts for building portfolio optimization models using fuzzy variables. We will focus on certain issues highlighted as above to present some major contributions of the recent literature from the field. (Received September 19, 2016)