# Abstract

This work comprises the qualitative properties of different classes of differential equations and inclusions, as well as some dynamical hardy-type inequalities on time scales.

Preliminary facts used in the thesis are given in Chapter 1.

In Chapter 2, the main qualitative properties of the solution set of almost lower (upper) semicontinuous, one-sided Perron differential inclusion with state constraints in finite dimensional spaces are studied.

We give sufficient conditions for the continuity (in the Housdorff distance) of the solution map of differential inclusion (DI). Some extensions to the well known relaxation theorems are proved, which are used afterward to find conditions under which system is invariant. We also give an application on the propagation of the continuity of the state constrained minimum time (min-time) function associated with the nonautonomous DI and the target zero.

In Chapter 3, we study fuzzy differential equations (FDEs) under mild assumption as compared with the already existing results in the literature, To overcome some difficulties as lack of compactness and other restrictive properties of fuzzy space $\mathbb{E}$, we use non compactness-type conditions and dissipative-type conditions. Our study is in the following order:

Existance of solution for FDEs is proved using Hausdorff measure of non compactness and with almost continuous right-hand side (R.H.S).

After it existence of solution for fuzzy integro-differential equations (FIDEs) is proved using Kuratowski measure of non compactness and almost continuous R.H.S. Also we pay our attention to fuzzy functional differential equations (FFDEs) with continuous R.H.S. Existence and uniqueness of the solution under dissipative-type condition are proved. Further the continuous dependence of the solution on the initial conditions is shown. The existence on infinite interval and stability of the solution are considered as well.

In Chapter 4 we extend some dynamic Hardy-type inequalities with general kernals

to arbitrary time scales using convex function of multivariables as well as of one variable. Since we get different applications when our convex function depends on one variable from the application when our convex function depends on more than one variable. Some classical as well as new inequalities are deduced in seek of applications.