The thesis deals mainly with fuzzy topological concepts, fuzzy filters and applications of fuzzy mathematics.

In the thesis, the notions of fuzzily closed subset, nearly fuzzy regularity, fuzzy regularity of a fuzzy topological space and the notion of semi Hausdorffness on fuzzy filters have been introduced and their properties have been studied. A new concept of strongly fuzzily closed subset of a product fuzzy topological space is introduced and the equivalent condition of nearly fuzzy Hausdorffness has been studied. The necessary and sufficient condition for a fuzzy topological space to be a nearly fuzzy regular space has been discussed. It has been proved that the arbitrary product of nearly fuzzy regular spaces is nearly fuzzy regular space. But in the case of fuzzy regularity only the finite product of fuzzy regular spaces is a fuzzy regular space. It is shown that the arbitrary product of fuzzy regular spaces need not be a fuzzy regular space. The relations between the existing definitions and new notions have been discussed.

A new concept of strong fuzzy filter has been introduced and the pointwise convergence filter on $Y^X$ with respect to the strong fuzzy filter on $Y$ has been studied. Some analogous results in the convergence of filter theory have been studied in fuzzy set up. The necessary and sufficient condition for a fuzzy topological space to be fuzzily compact has also been studied by means of fuzzy filter convergence.
In the thesis, notions of induced topology on the collection of fuzzy singletons with respect to fuzzy topological space and induced topology on the collection of intuitionistic fuzzy singletons with respect to intuitionistic fuzzy topological space are introduced and studied. The relations of the existing notions in fuzzy topological spaces and intuitionistic fuzzy topological spaces with their analogous notions in these topologies have been discussed.

Finally an innovative method of fuzzy decision making using two dimensional fuzzy numbers has been introduced by defining a new formula for the hesitation. It is illustrated by an example in health care.