This thesis aims at giving an axiomatization for the operation of if-then-else over algebras of non-halting programs and non-halting tests, and further, makes use of this axiomatization to study structural properties of the algebra of conditional logic.

To this aim the thesis introduces the notion of $C$-sets by considering the tests from a $C$-algebra. When the $C$-algebra is an ada, the axiomatization is shown to be complete through a subdirect representation. Further, this thesis gives an axiomatization for the equality test along with if-then-else through the notion of agreeable $C$-sets, which is complete for the class of agreeable $C$-sets where the $C$-algebra is an ada. The thesis also introduces the notion of $C$-monoids which consider the composition of programs as well as composition of programs with tests along with if-then-else. A Cayley-type theorem is obtained in that every $C$-monoid where the $C$-algebra is an ada is embeddable in a functional $C$-monoid.

The thesis also uses the if-then-else action to study the structure of $C$-algebras through the notions of annihilators and idempotence, through which a classification of elements of the $C$-algebra of transformations $3^X$ is achieved. The thesis also proposes the notions of atoms and atomicity in $C$-algebras and obtains a characterisation of atoms in $3^X$. Further, the thesis presents necessary or sufficient conditions for the atomicity of $C$-algebras and shows that the class of finite atomic $C$-algebras is precisely that of finite adas.