UNIT 4. Languages and Formal Grammars

Formal languages are studied in Linguistics and Computer Science. Computer scientists privilege a recognition approach based on abstract machines (automata) that take in input a sentence and decide whether it belongs to the reference language. Grammars are used as a finite formal representation that can describe an infinite language. The Chomsky Hierarchy classifies grammars and languages into four types. Type-0 Languages, which are also known as Unrestricted Languages, are recognized by means of Turing Machines. Type-1 languages, which are also known as Context-Sensitive Languages, are recognized by means of Linear-Bounded Automata. Type-2 Languages, which are also known as Context-Free Languages, are recognized by means of Push-Down Automata. Type-3 Languages, which are also known as Regular Languages, are recognized by means of Finite Automata.

The main objectives of Unit 4 are:

- To introduce the concept of grammar.
- To know how to calculate equivalent grammars.
- To classify grammars according the Chomsky Hierarchy.
- To learn basic concepts related to grammars (recursion, ambiguity).
- To know how to represent if a word is recognized by a grammar or not (derivations and parse trees).
- To describe Regular Grammars and their equivalences.
- To introduce Context-Free Grammars languages.
- To know how to calculate a Well-formed grammar.
- To learn the Chomsky Normal Form and the Greibach Normal Form.