This chapter presents tools and environments that are used for design with Field Programmable Logic Devices. We discuss steps involved in taking a hierarchical, high-level design from a description of the design to its implementation in an FPLD. Processes and terminologies are illustrated here. After the first section that discusses design flow, the proceeding sections elaborate on each step of this design flow.

1.1 Design Flow

For the design of FPLDs, the design flow begins with specification of the design and ends with programming the target device. Figure 1.1 shows steps involved in this design flow.

In the design entry phase, a design is specified as a mixture of block diagram and textual specifications. After performing pre-synthesis simulation, this design is taken through the synthesis process to translate it into actual hardware of the target device. Here, target device refers to the FPLD that is being programmed for the implementation of our design. After the synthesis process and before the actual device is programmed, another simulation is done that is referred to as, post-synthesis simulation. The difference between pre- and post-synthesis simulations is in the level of details obtained from each simulation.

The sections that follow elaborate on each of the blocks shown in Figure 1.1. In these sections we make reference to Altera's Quartus II integrated design tool. Most FPLD design tools provide blocks shown in Figure 1.1 in one or several environments. Quartus II provides all the necessary utilities under
one environment, which makes it easy to learn and is typical of a complete environment.

![Figure 1.1 FPLD Design Flow](image)

**1.2 Design Entry**

A design entry tool allows a designer to specify his or her design in textual and/or graphical form. Generally, when specification of component interconnections is being done, a graphical entry tool suits best, while component behavior is best described by textual design entry methods. Whether to use a graphical or a textual design entry method also depends on the level of components being described and available parts. Usually, a design is specified by a mixture of graphical and textual representations, and design entry tools allow both schemes. Methods of design entry at various levels of hardware description are described in the following sub-sections.