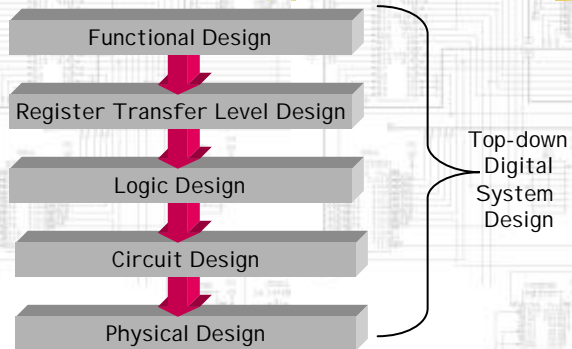


Digital System Design



Functional Design

- ▶ Functional design is based on:
 - ▶ Requirement specification
- ▶ Target implementation influences the design flow
 - ▶ CPU
 - ▶ ASIC (Application Specific Integrated Circuits)
 - ▶ FPGA (Field Programmable Gate Arrays)
- ▶ Requirements:
 - ▶ Operation, Performance, Interface, Cost, Size, Power dissipation...
- ▶ Functional design may be verified through simulation

Register Transfer Level Design (RTL)

- ▶ This step in the design flow transforms the high-level functional design into a description at the register level.
- ▶ The Register Transfer Level Design describes the design at the following level of abstraction:
 - ▶ Registers
 - ▶ Memory
 - ▶ Arithmetic Units
 - ▶ State Machines
- ▶ RTL designs are validated through simulation

Logic Design

- ▶ At this stage in the design flow the register level transfer design is compiled into logic design.
- ▶ Again the design may be verified through simulation.
- ▶ Please note:
 - ▶ Simulation may be used to guaranty that the design meets the specification.
 - ▶ The simulation in every step in the design flow allows for the interception of errors early in the design.

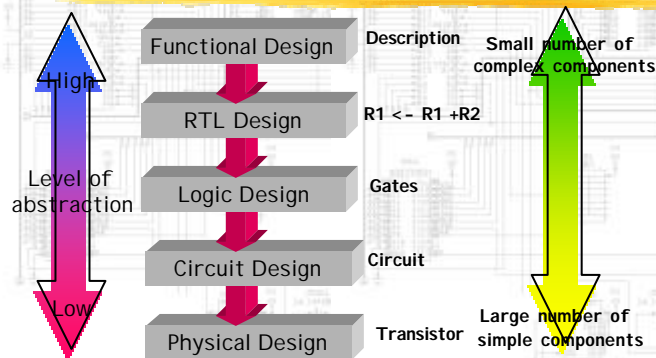
Circuit Design

- ▶ At this stage in the design flow the logic design is compiled into circuit design.
- ▶ The step is strongly influenced by the target implementation.
- ▶ Again the design may be verified through simulation specifically through:
 - ▶ Timing simulation
 - ▶ Circuit analysis.

Physical Design

- ▶ In the final step in the design flow the circuit design determines the physical chip layout.
- ▶ Physical properties may be verified:
 - ▶ Chip area
 - ▶ Power dissipation
 - ▶ Clock frequency

Digital System Design Hierarchy



Hardware Description Languages

- ▶ Hardware Description Languages are used to:
 - ▶ Describe digital systems
 - ▶ Model digital systems
 - ▶ Design digital systems
- ▶ Hardware Description Languages:
 - ▶ VHDL, Verilog and more
- ▶ **VHDL**
 - ▶ VHSIC Hardware Description Language
 - ▶ VHSIC
 - ▶ Very High Speed Integrated Circuit Language

