Chapter 1

Introduction
About this course

• This is the first of a two-course series on computer hardware offered by the Computer Science Department.
• In this course you will learn how to analyze and synthesize digital circuits that can be used as the building blocks of a computer.
• You will learn how to use them to build a computer in the next course (COSC 3330).
The course web site

www.cs.uh.edu/~jhuang/JCH/LD

• You will find the syllabus, lecture schedule, slides, notes, study guides, old tests, lab information, and anything needed for, or available from, this course there.

• To keep abreast with the class, visit this web site regularly!
Digital Systems

The idea of representing information in a discrete form and the manipulation of such information is fundamental to all digital systems.
Historical background

• The first mechanical digital calculator, developed by the Frech mathematician Blaise Pascal, dates back to 1642.
Historical background (continued)

- The concept of a general purpose digital computer dates to 1833. It was the work of the English mathematician and scientist Charles Babbage.
Historical background (continued)

• The telephone switching systems developed in 1930s became the first practical digital systems. Those systems used electromechanical relays as the basic digital components.
Historical background (continued)

• The commercial digital computer became a reality in 1951 with the UNIVAC.
Historical background (continued)

Advancement in basic digital devices:

• Electromechanical relay - slow and unreliable

• Vacuum tube - faster than relay, short life span, great deal of power consumption and heat dissipation

• Transistor - small, fast, long life, low power consumption and heat dissipation
Historical background (continued)

• Advancement in semiconductor electronics allows fabrication of a digital system or subsystem on a single chip (semiconductor substrate).
A silicon wafer on which digital circuits are fabricated
A large-scale integrated circuit [Brown]

Group of 8 logic cells

Memory block

Interconnection wires
A system implemented on a printed circuit board [Brown]
Digital vs. Analog

• Information can be represented in digital or analog form.
• In a digital representation, information is denoted by a finite sequence digits, whereas in an analog representation information is denoted by a continuum.
• Electronic devices and circuits have been developed to process information in digital or analog form.
Digital vs. Analog (continued)

- With today’s technology, however, digital systems are generally and significantly more capable, cost effective, reliable, and versatile.
The basic organization of a digital computer [Givone]