SEE1223: Digital Electronics

Introduction

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Course Information

- This course introduces students to
  - number systems (2 hours)
  - basic gates (3 hours)
  - Logic Design (3 hours)
  - MSI circuits (3 hours)
  - flip-flops (3 hours)
  - Counters and registers (3 hours)
  - Memory devices (1 hours)
- Students will also be exposed to the latest digital electronics design software – Altera Quartus II

References

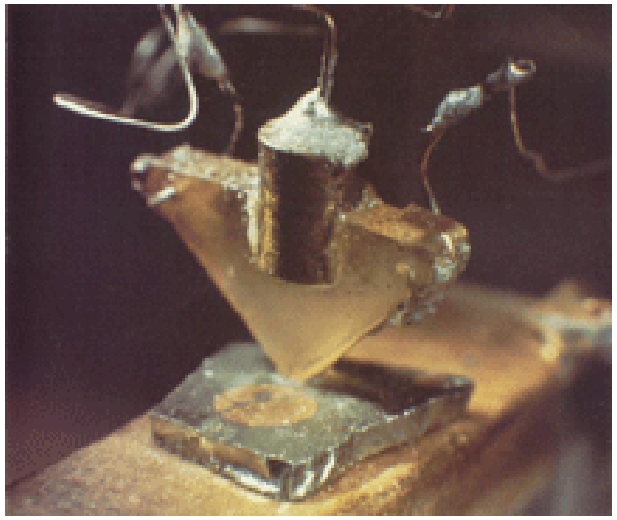
1. **Thomas L. Floyd, "Digital Fundamentals" 9h Ed., Prentice-Hall, 2007 ****
2. Tocci & Widmer, "Digital Systems - Principles and Applications", 10 Ed., Prentice- Hall, 2007.
3. M. Morris Mano, "Digital Design", 4'h Ed. Prentice-Hall, 2007.

**** Textbook that we will use in class**

Introduction to Digital Electronics

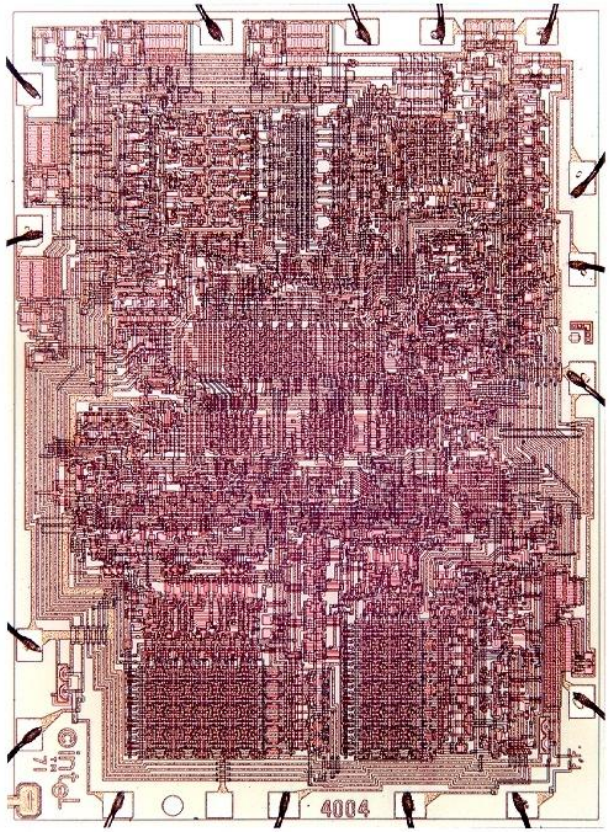
- Why study digital electronics?
- Why is it important?
- What is the most basic component of digital electronics?
- Examples of digital electronic systems?

History of Digital Electronics



- 1947: First transistor at Bell Labs by Bardeen and Brattain
- 1950: Junction transistor by William Shockley
- 1954: First silicon transistor from Texas Instruments
- 1955: Field Effect Transistor (FET) developed at Bell Labs

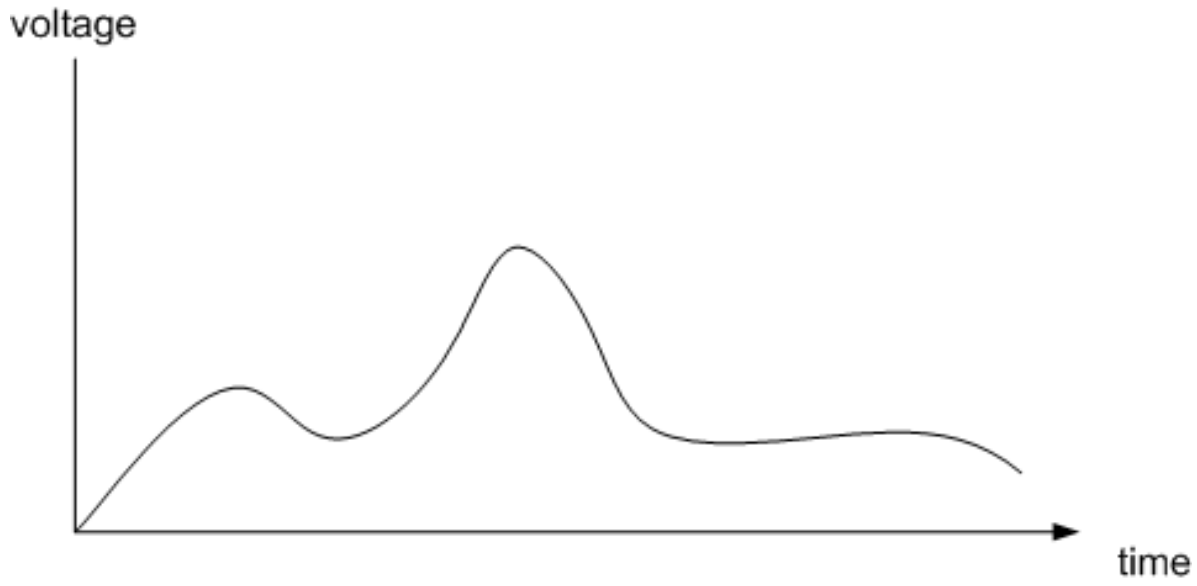
History of Digital Electronics (cont.)



- 1958: First IC by Jack Kilby of Texas Instruments
- 1960: First MOSFET fabricated by Kahng of Bell Labs
- 1963: CMOS invented by Frank Wanlass of Fairchild Semiconductor
- 1971: First Microprocessor, the Intel 4004 with 2300 transistors
- 2006: Intel Core 2 Duo with 820 million transistors

Analog and Digital signals

- **Analog**: quantity that has **continuous** values
- **Digital**: quantity that has **discrete** values



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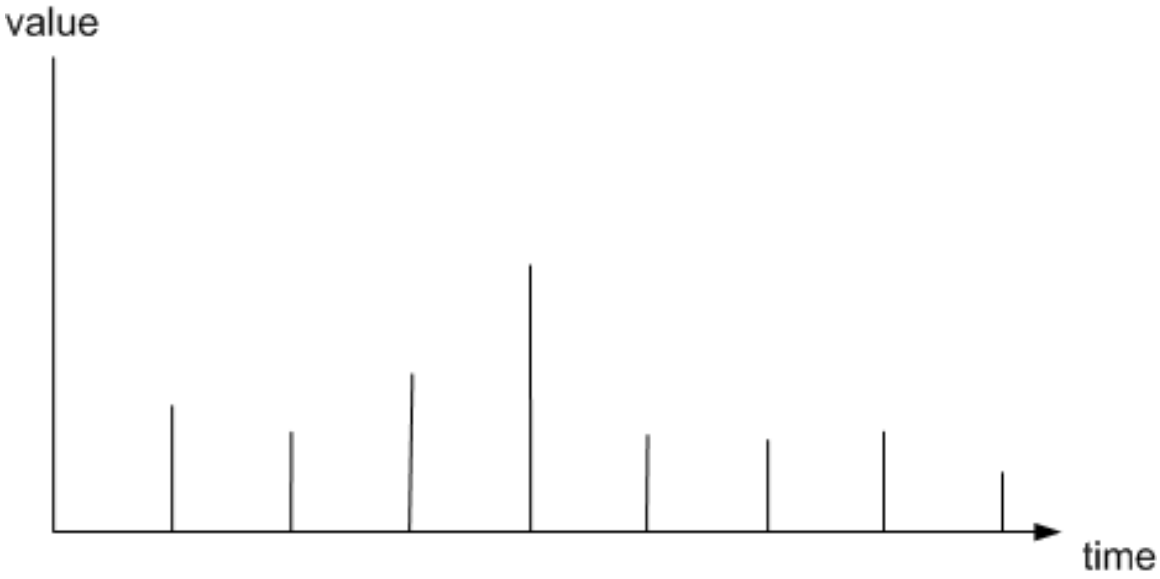

Analog vs Digital Signals

- Analog signals can take *any voltage* values, i.e. 1V, 2.5V, 23V, 0.34V, etc.
- Digital signals can take only *two voltage* values, i.e. 5V and 0V (or any two distinct values)
- For simplicity, 5V is referred as “1” and 0V is referred as “0”

Advantages of digital systems

- Advantages of digital systems
  - Easy to manipulate digital data
  - Less error prone/not much affected by noise
  - Easy to store data
- Disadvantages of digital systems
  - Cannot transmit over wireless
  - Lose some information (usually not critical)

Analog and Digital Systems

- Analog system: microphone-speaker, analog radio
- Digital system: computer, calculator
- Analog and Digital system: hand-phone, digital TV