## Course Overview

- Representing Information with Numbers
- Number Bases
- Boolean Logic / Boolean Algebra
- Digital Design
  - Combinatorial Circuit Design
  - Sequential Circuit Design
- Design of Specific Hardware Components
- Computing System Hardware Organization

## Core Concept

All Information can be modelled using Numbers and some appropriate Conventions.

Which numbers? More accurately which number base?

## Base 10

0 1 2 3 4 5 6 7 8 9

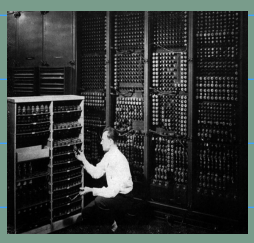
### Positional Counting System

| $10^4$ 10000s | $10^3$ 1000s | $10^2$ 100s | $10^1$ 10s | $10^0$ Units |
|---|---|---|---|---|
| | 0 | 0 | 0 | 0 |
| | ⋮ | 0 | 0 | 1 |
| | ⋮ | ⋮ | 0 | 2 |
| | ⋮ | | 0 | 3 |
| | | | ⋮ | ⋮ |
| | | | 0 | 9 |
| | | | 1 | 0 |
| | | | 1 | 1 |
| | 0 | 0 | 1 | 2 |

The leftmost digit is called the most Significant Digit and the rightmost, non-zero, digit is called the least Significant Digit.

Base 10 is "natural" for humans

But, is it natural for a machine?



The ENIAC Computer (1946) used base 10

Today machines use Base 2 : Binary 0, 1. Why?

Digital Computers are Composed of billions of transistors.

A transistor is a Switch which Can be in one of two states

On or off

When a transistor Is in the off state, its output Is 0 volts and it is 5 volts when it Is on

We associate On (5v) with the binary value 1
and off (0v) " " " " 0

This Is our first level of Abstraction.

This Is where the Software Comes into existence !