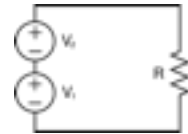


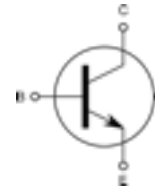
# Computer Design I - PCR - Fall 2015

## Class overview

- circuits:
  - analog vs. digital electronics
  - electric components: batteries, resistors, lamps, transistors, LED
  - reading circuits and assembling circuits



- basic logic design
  - truth tables
  - basic logic gates: not, and, or, nand, nor
  - multiplexers, demultiplexers



- combinatorial logic
  - binary representation
  - binary addition and subtraction
  - half-adders, full adders, incrementers
  - the arithmetic logic unit (ALU)



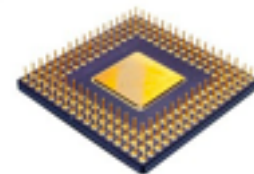
- sequential logic
  - timing
  - data flip-flops
  - registers, memory, counters



- machine language
  - the BASIC language and the GOTO logic
  - arithmetic and logic operations
  - memory access
  - flow of control



- computer architecture
  - The von Neumann architecture
  - RAM
  - the Central Processing Unit (CPU)



## Safety:

The circuits that we will build in this class use a very small power, similar to that in a small flashlight. In our case, the static electricity of our bodies pose a far greater danger to the electronic component than our circuits will pose to us. Still, here are some considerations:

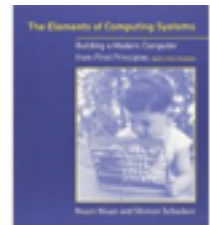
1. Do not short-circuit a battery.
2. Do not carry 9v batteries in your pocket, e.g., a coin in your pocket can short-circuit it.
3. Remove batteries from the battery holders when you are not using the circuit.
4. Treat the electronic components with care: they break easily
5. Although we will use components that are fairly resistant to the static electricity of our bodies, touch a metallic object to discharge yourself from electricity before touching an electronic component.
6. Avoid touching the metallic parts of an electronic component; hold the component by its plastic container.
7. Treat the breadboard with care; a damaged slot cannot be repaired.

# Computer Design I - PCR - Fall 2015

## FAQ

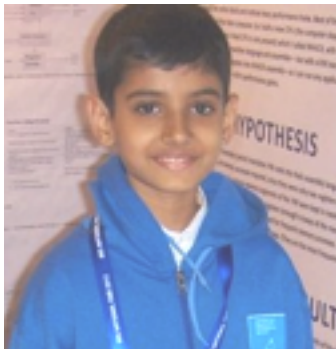
### Where can I study this stuff on my own?

- *Code* by Charles Petzold
  - build the hardware of the computer starting from relays
  - very good chapters in binary systems
- *The elements of Computing Systems* by Nisan and Schocken
  - build the hardware and software of the computer starting from Nand gates
  - Full class at <http://www.nand2tetris.org/>
  - Coursera is offering this class as *Nand to Tetris*



### How far can I go?

- The hardware portion of the class (Computer Design I) can be tackled with Intro. to programming I. The software portion of the class (Computer Design II) requires Intro. to programming II.
- In spite of the lack of prerequisites of this class, it is full of new and counter intuitive concepts. Tackling it on your own, without any guidance or support, will very likely lead to a discouraging experience.



### I'm a kid. Can I really do this?

- It depends on you, of course. My guess is that only a few kids will have the interest and determination to go through this class and finish it. However, if you are in this class is because you probably are one of those few kids.
- The youngest kid on record to finish this class (both software and hardware portions) is [Saad Naser](#) who was 11 at the time.

### Is this really a college level class?

Absolutely. It is an unusual class, though, and you will only find it in a handful of universities, and even those do not offer it all the time. It was taught at Harvard (2005) and Stanford (2012), among others.



### Is what we are going to study used in real life?

- Steve Wozniak and the Apple I... yes =-)

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