

Purpose of ENGR 171

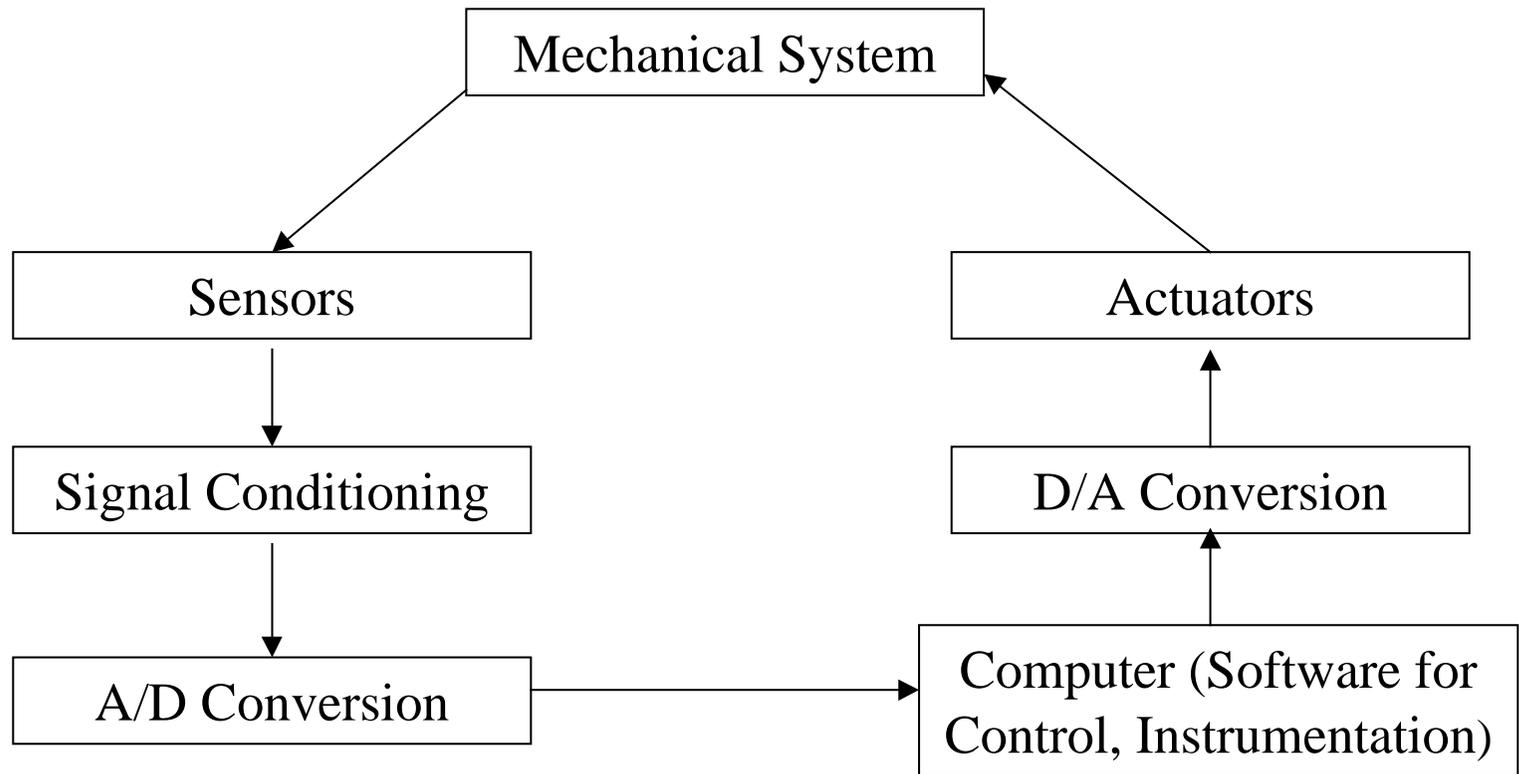
- * To learn “hands-on” about mechatronic systems
- * An introductory course designed to be fairly interesting with minimal “busy” work



Mechatronics

- * Multidisciplinary approach to systems
 - Electrical Engineering
 - Mechanical Engineering
 - Computer Science

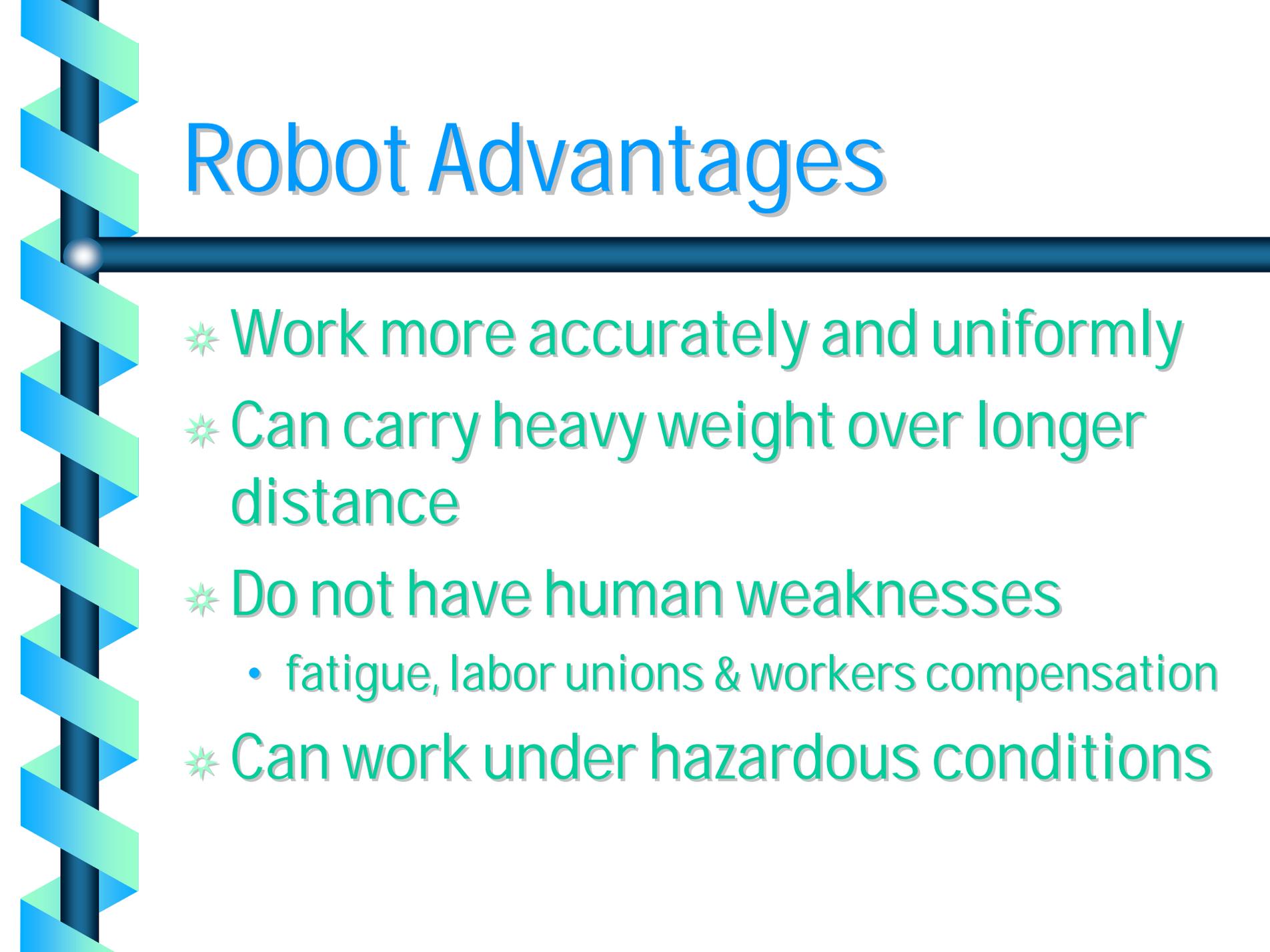
Mechatronic System





Robot Historical Notes

- * Organs with moveable figures
 - 270 BC, Ancient Greece
- * Writing & drawing mechanical dolls
 - 1770s, Switzerland
- * Radio-controlled submersible boat
 - 1898, Tesla in NY
- * "Robot" coined from Capek's *R.U.R.*
 - 1921, Czechoslovakia



Robot Advantages

- * Work more accurately and uniformly
- * Can carry heavy weight over longer distance
- * Do not have human weaknesses
 - fatigue, labor unions & workers compensation
- * Can work under hazardous conditions



Robot Disadvantages

- * Expensive - time & money
- * Limited range of tasks
- * Lack human judgement



Embedded Systems

- * ~100% of worldwide microprocessor usage
- * Unlike personal computers, user cannot change the functionality by installing new software



Embedded systems

* Like computers,

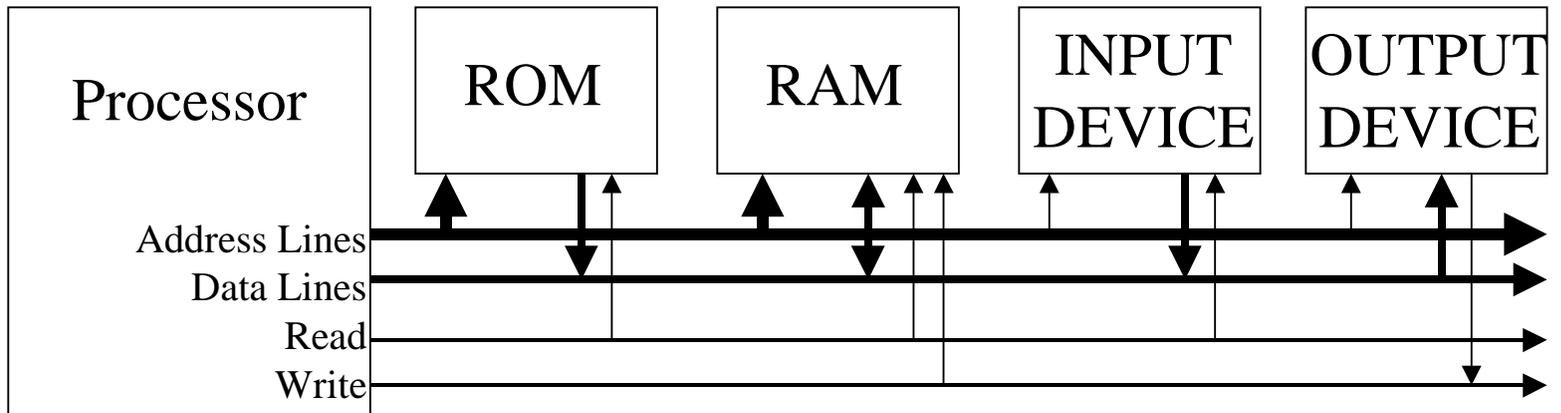
- Microprocessor must be fast enough
- Memory must store software and data
- Software must define function
- Peripherals allow for communication



Microcontroller

- * An integrated circuit containing
 - a microprocessor
 - memory
 - input device
 - output device

Microcontroller



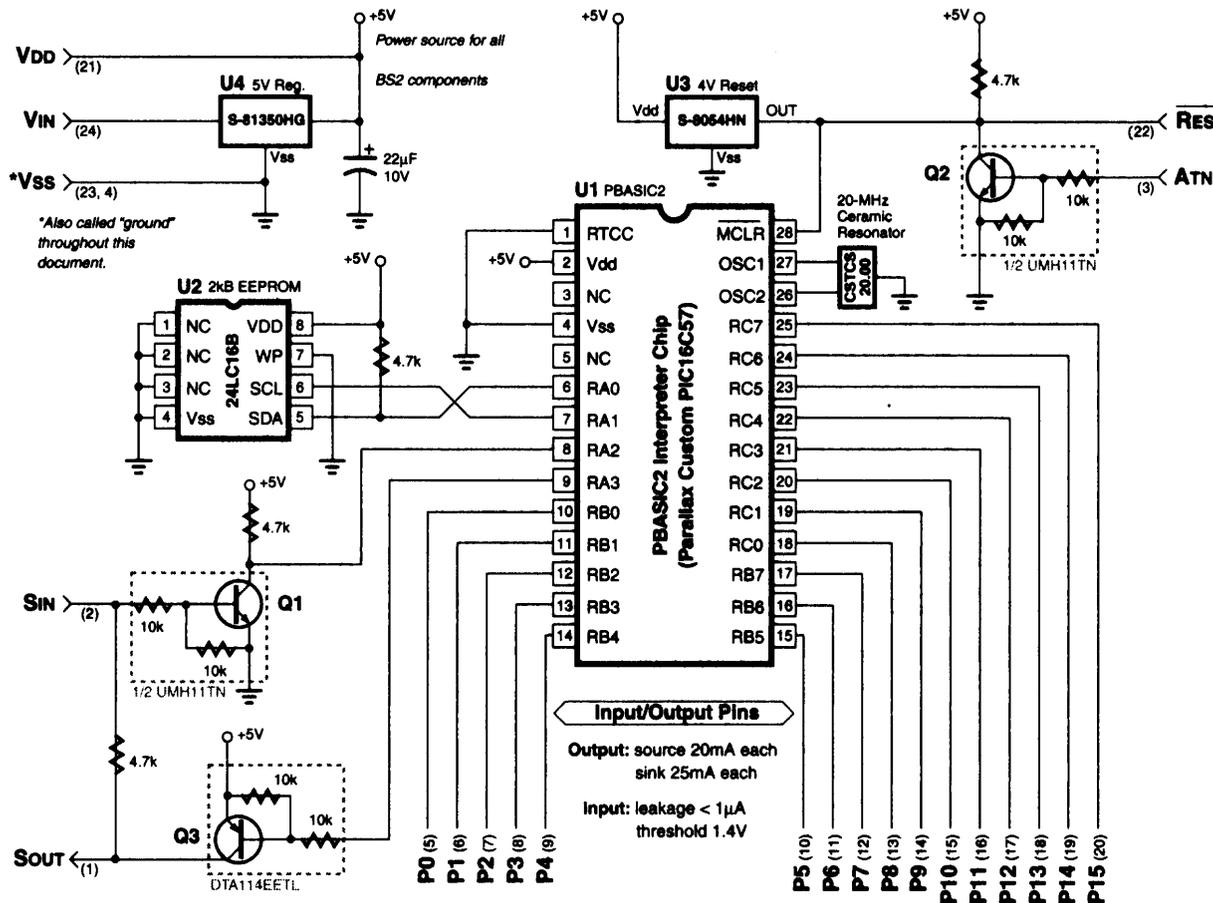


The Basic Stamp II (BS2-IC)

* PIC16C57 microcontroller

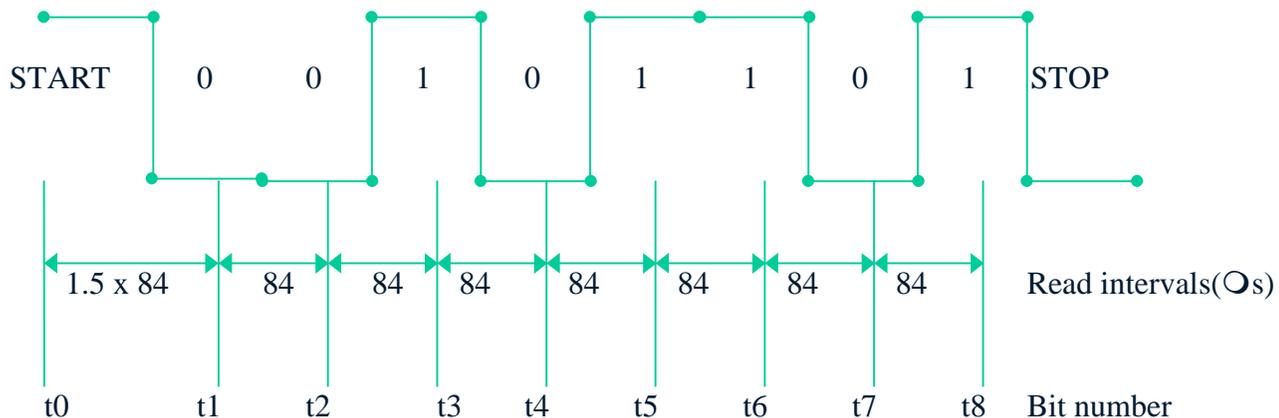
- Programmed with PBASIC2 instructions
- 16 I/O pins for general use

The Basic Stamp II (BS2-IC)



Serial Communication

- * Programs downloaded from PC
- * BS2 changes +/-12 V to 0 or 5 V
- * Asynchronous data transfer



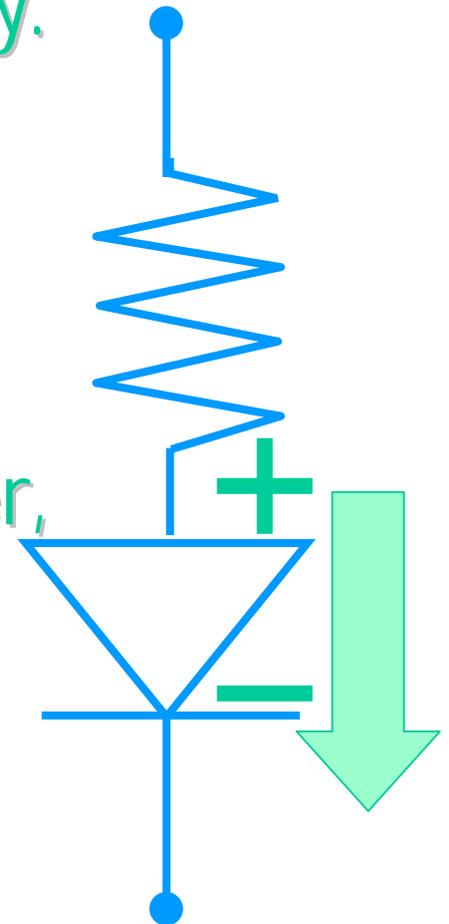


Memory

- * 2K EEPROM
- * 32 bytes RAM, which include:
 - 6 bytes for I/O and control of I/O
- * DIRS - I/O Control
 - 2 bytes - 1 bit for each pin
 - A stored zero means input mode
 - A stored one means output mode

LED Operation

- * Current through LED flows 1 way.
- * Current flows if anode (+)
- * is at a higher potential (V)
- * than cathode (-).
- * If voltage at the anode is higher,
- * then LED is reverse biased and
- * no current flows.





Ohm's Law

- * Current is inversely related to resistance.
- * Increase resistance, decrease current.

$$I = \frac{V}{R}$$

- * Voltage, V , in Volts (V)
- * Current, I , in Amperes (A)
- * Resistance, R , in ohms (Ω)

Sample code (Pg. 16)

- * Output 0 'Make I/O pin 0 an output
- * reblink: 'Loop label
- * out0 = 0 'Output 0 V at I/O pin 0
- * pause 1000 'Pause 1000 ms (1 s)
- * out0 = 1 'Output 5 V at I/O pin 0
- * pause 1000 'Pause 1000 ms (1 s)
- * goto reblink 'go back to label reblink