Advanced Manufacturing Academy

ROBOTICS – 3 OUTPUTS

College of Engineering and Technology

East Carolina University

Our Robot – Outputs

- Want to use Arduino for control..

- Learn about outputs & programming

- Todays plan….

  ➢ Arduino – overview - UNO Architecture

  ➢ Arduino programming - IDE

  ➢ Types outputs

  ➢ How to program these outputs

  ➢ Experiment – Try it out

Arduino Background

- Arduino is an Open Source Controller
- All the information is at
  - www.arduino.cc
  - 22 styles controller + MANY accessories

BOARDS (Compare Specs)   SHIELDS   KITS

Arduino Uno   Arduino Leonardo   Arduino GSM Shield   The Arduino Starter Kit

Arduino Due   Arduino Yún   Arduino Ethernet Shield   Arduino Materia 101
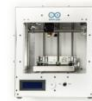
The Arduino Uno - Parts

- Architecture - Layout

TRANSMIT RECEIVE LEDs

DIGITAL OUTPUT PINS

POWER LED

USB PORT

POWER PLUG

RESET BUTTON

POWER PINS

ANALOG INPUT PINS
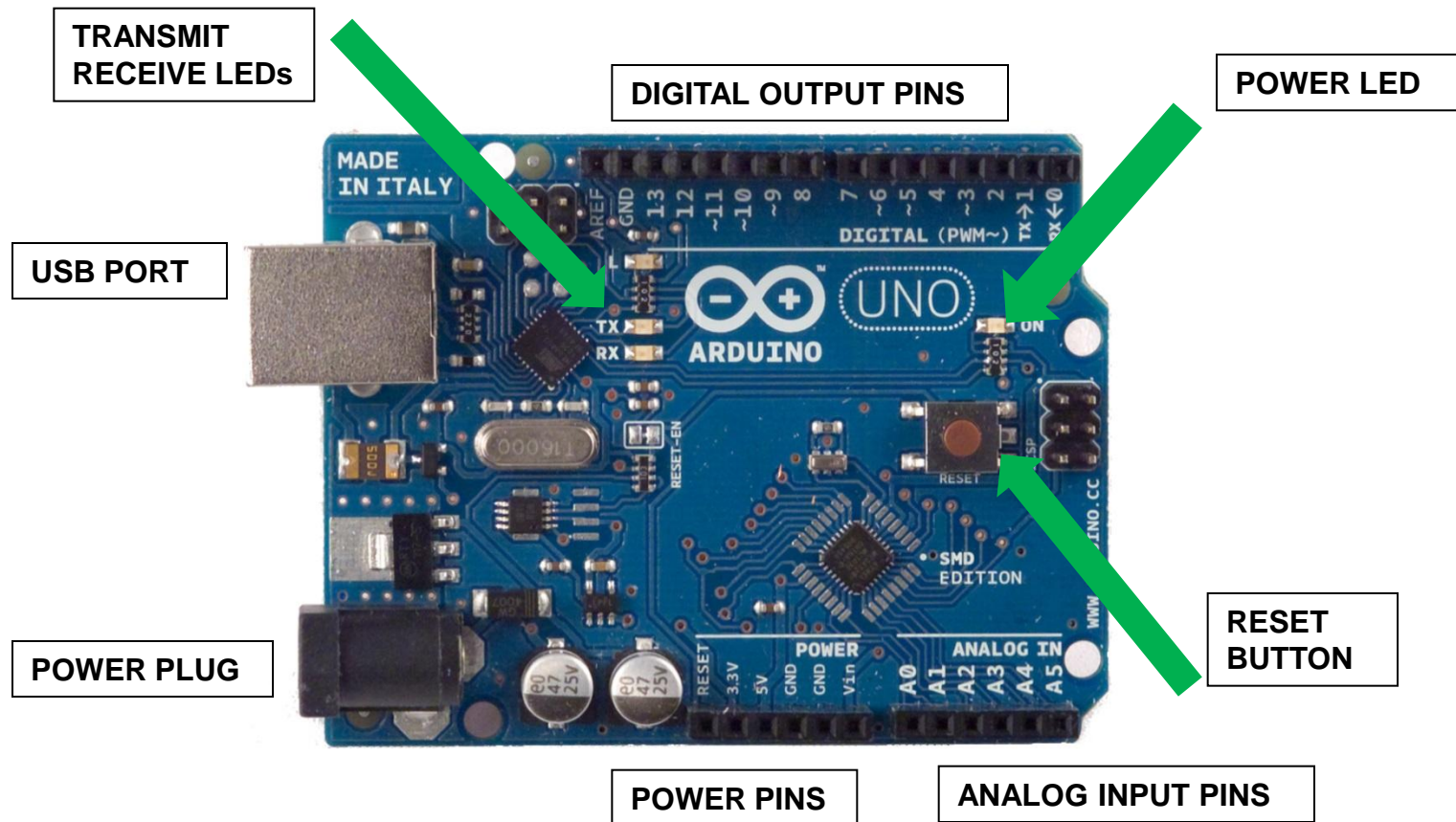
Outputs – Two Options

- Pins 3 – 13 – Output Pins
- Two Options
  - Digital – On/Off
  - PWM – Pulse Width Modification
- 3 – 13 can all be digital outputs
- PWM on Pins 3,5,6,9,10,11
- What does "Digital" mean?
- What does "PWM" mean?

Digital Outputs

- Digital Outputs - Send signal out
  - ➢ Can set pins 3 – 13 to outputs
  - ➢ Digital is "ON / OFF"
  - ➢ No in between
  - ➢ On is 5 volts – Off is 0 volts
- Maximum Power output is 40 mA
- What can we do with 5Vdc at 40mA?
  - ➢ Lots! But we'll have to learn some electronics.

Loading Code – Getting Started

- Time to start talking to the Arduino
- Need to use the Arduino Programming Language
  - Programming IDE (Integrated Development Environment)
  - Free download from arduino.cc
  - LOW Overhead
  - Easy to use
  - DON'T PANIC!
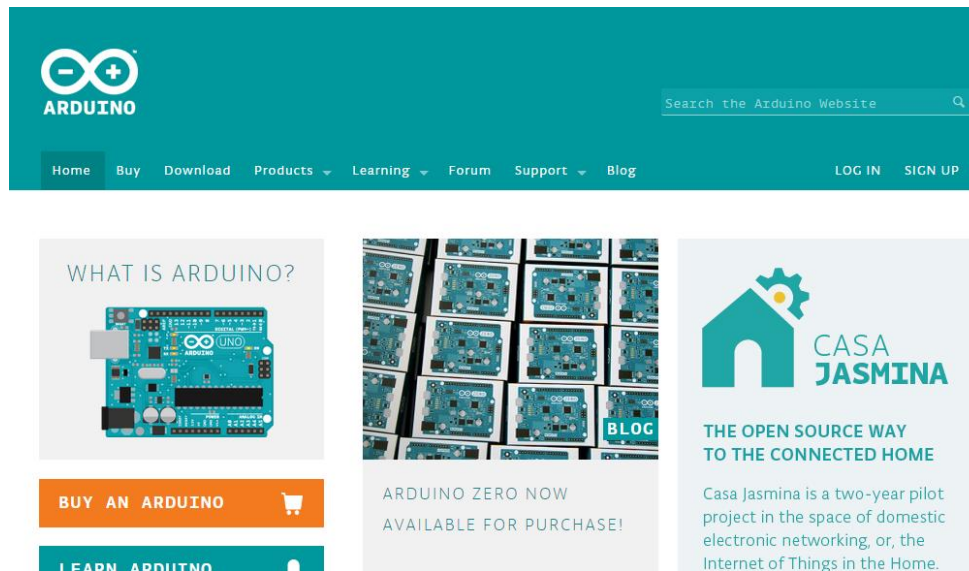
Start Your Software

- Find this Icon on the desktop and click..

Start Your Software (2)

- Let it start up – It should look like this..

FREE Software

- Don't know how to program?

- Don't worry

- We're going to borrow code

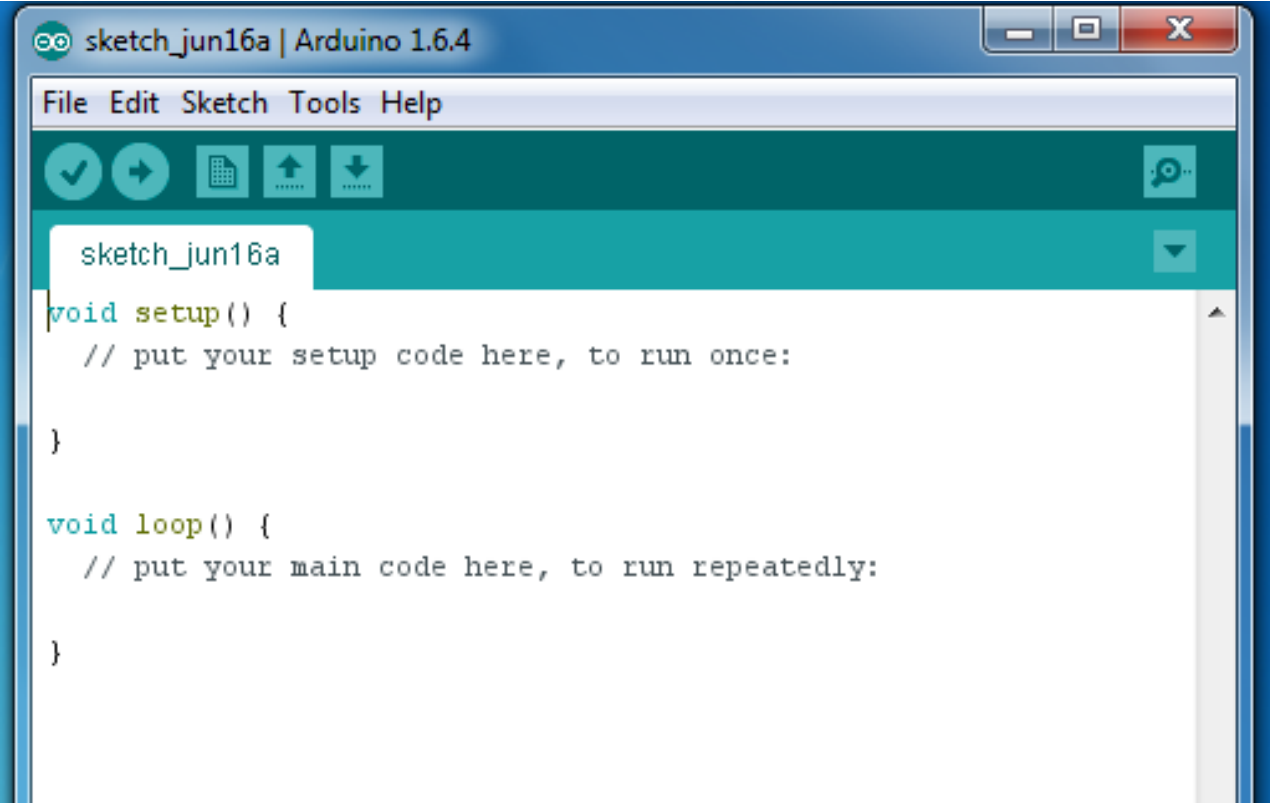- Go to Arduino.cc – click on Learning

LEARNING AT Arduino.cc

- Go to "Learning" – Click on Examples

- They give us very nice instructions

- AND…..

  ➤ Sample code..

- Tweak/Use the examples!

```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeatedly.

  This example code is in the public domain.
 */

// Pin 13 has an LED connected on most Arduino boards.
// give it a name:
int led = 13;

// the setup routine runs once when you press reset:
void setup() {
  // initialize the digital pin as an output.
  pinMode(led, OUTPUT);
}

// the loop routine runs over and over again forever:
void loop() {
  digitalWrite(led, HIGH);   // turn the LED on (HIGH is the voltage level)
  delay(1000);               // wait for a second
  digitalWrite(led, LOW);    // turn the LED off by making the voltage LOW
  delay(1000);               // wait for a second
}
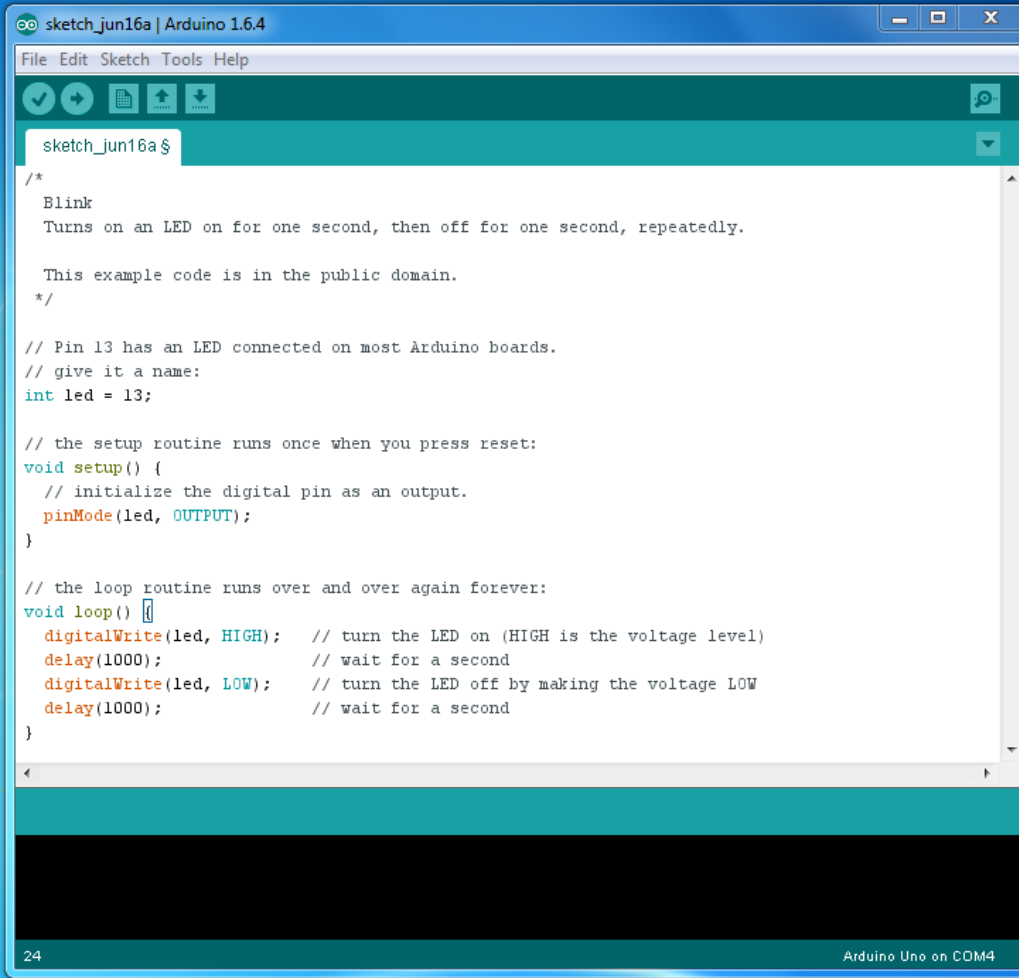```

# CODE DETAILS – Blank Code

- The Code… lets explore

# USE THE BLINK CODE

- We will use the blink code provided!
- Navigate to arduino.cc
- Go to Learning => Examples
- Go to "Basics" and click on BLINK

# USE THE BLINK CODE (2)

- We will use the blink code provided!
  - ➢ Highlight blink_example
  - ➢ Paste into Arduino Software
  - ➢ Get all the braces!

# USE THE BLINK CODE (3)

- Should see this in your window

# CODE DETAILS – Blink (1)

- The Code… lets explore

```
/*
  Blink
  Turns on an LED on for one second, then off for one second, repeatedly.

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# CODE DETAILS – Blink (2)

- The Code… lets explore

```
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}
```

How to connect your Robot

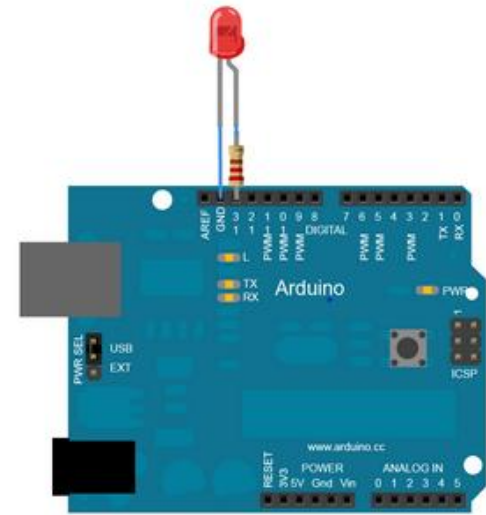- Plug USB into PC
- Plug USB into Arduino
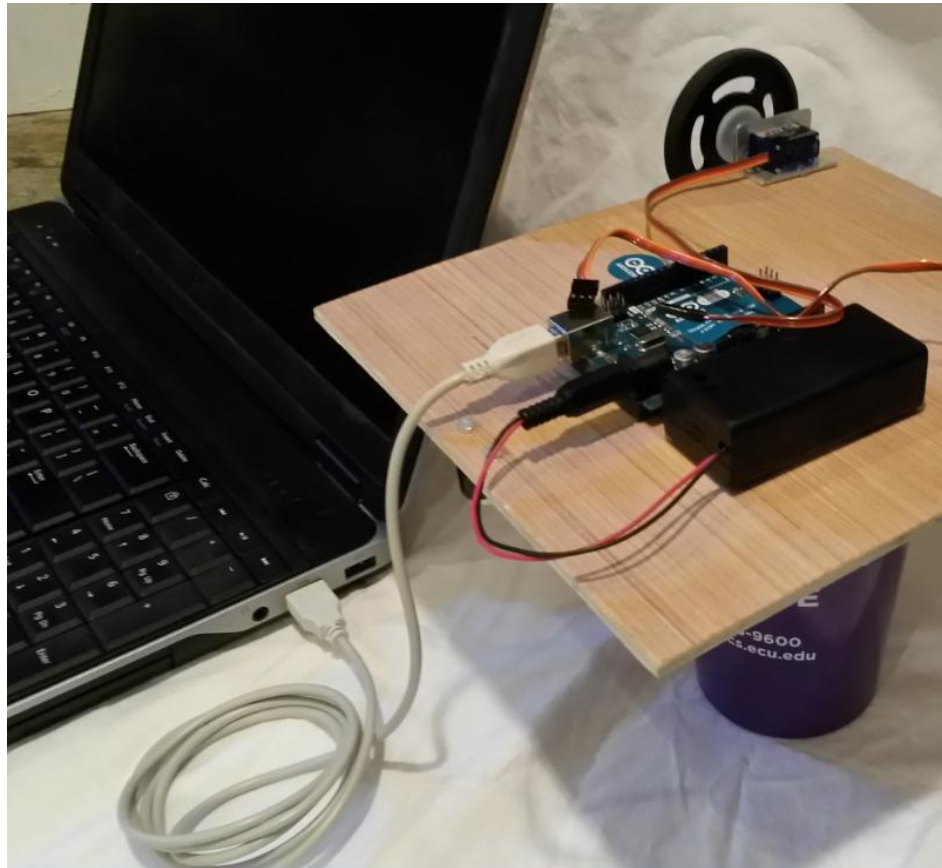
Blink Experiments

- Load and operate the blink code
- Alter the blink code to change blink pattern – Faster? Slower?

Blink Experiments 2

- Add External LED as shown.
- Operate external LED
- What is an LED?
- Why do you need the resistor?

Blink Experiments 3

- Move external LED to pin 8

- Modify code to operate external LED on pin 8

- Additional code practice activities

  - ➤ Make both lights blink

  - ➤ Make lights blink together

  - ➤ Make lights alternate