

## **Robotics 1 – Final Study Guide**

*I will also suggest you study the references uploaded every week to understand the subject better, but final is based only on the presentations/labs/homework – all questions come directly from it.*

main function of PWM, how does Arduino send PWM via software – learn the code and Fade sample Examples>Basics>fade

learn Examples>Servo>knob and sweep

learn Examples>Analog>fade

duty cycle – what is it, period,

PWM is useful because it provides exact control, produces less heat than old relays, quiet operation (except for a slight hum you can hear sometimes)

PID – what does each one do? Proportional integral and derivative – learn what goes into each one.

Closed loop systems – what is the set point and the process variable, why is it important in robotics

Modified vs unmodified servo motors how does the PWM pulses going to the servo work?

H bridges and how do they control speed and direction of motors. How to control a regular DC motor with a transistor, Arduino and analog sensor such as a potentiometer

Sensors: connecting and programming an analog sensor to an Arduino (potentiometer, CDS or light sensor), digital sensors (switches), and infrared transmitters.

Showing a list of sensor determine if it is an analog or digital sensor

Optical encoders – how do they work?

What is triangulation?

### **Also material from the first part:**

#### **Arduino Program Structure:**

setup() //things here run once

loop() //things here run forever

if...else

for loop

;(semicolon)

{ } (curly braces)

// (single line comment)

## Comparison Operators:

== (equal to)

!= (not equal to)

< (less than)

> (greater than)

<= (less than or equal to)

>= (greater than or equal to)

What do each of these lines of code do?

Do you put them in setup(), loop(), or before setup()?:

## Commands to learn and understand:

Serial.begin(9600); start outputting to the Serial Monitor tool at 9600 bps

int sensorValue = analogRead(A0);

Serial.println(sensorValue); printing a result of a calculation or measure value to the screen on the serial monitor.

delay(100);

int led = 13;

pinMode(led, OUTPUT);

digitalWrite(led, HIGH);

analogWrite (RedPin, 255);

tone(9, 440, 100); // produces a tone if speaker or piezo is connected to pin 9, 440 is the frequency and 100 is the amount of time to be on

Arrays, learn about indexes and how arrays store values. Learn an example of using arrays.

## Examples to study:

Arduino > File > Examples > 1.Basics > Blink

Arduino > File > Examples > 1.Basics > AnalogReadSerial

Arduino > File > Examples > 1.Digital > Button

Arduino > Tools > Serial Monitor

## Basic sensors used in the class

Input: switch (digital), a potentiometer (analog), a CDS or light intensity analog sensor

Output Devices: LED, Sound