Version 2.0

ECE Department

Portland State university

ECE 211 Intro to Design processes

Lab-A1

**Lab-A1: digital inputs, buzzer, switch, and servo**

# Required Hardware & Software

* Arduino UNO Rev 3 microcontroller board and kit (-*or*- compatible clone)
* Your own laptop or desktop computer
* Arduino hardware drivers and Arduino Desktop IDE software
* Access to D2L

# Introduction

Most of the labs are straightforward but please try to understand the underlying principles of both the HW and SW operation. In other words, do not stop at just copy-pasting of the existing code.

First things first – you need to install the required software on your computer (laptop or desktop). Instructions on how to do this are posted on D2L in the “Lab 0” folder but you can also download them from the Elegoo site here <https://www.elegoo.com/download/> (it is part of the software associated with the “Elegoo UNO R3 Super Starter Kit”). Your Scrum Master will ask you to show that you have installed this software and that it runs properly. Obviously, you cannot do the actual labs without this first step!

Your tasks are:

* Follow the instructions for the given lesson.
  + You will download lessons and code from D2L, construct a small circuit, and run the sample code. You will have the chance to enhance the programs later.
* Answer a few questions on a worksheet and upload it on D2L.
* Demonstrate your work to your Scrum Master (helper).

For Lab-A1, the lessons are simple and are designed to make you familiar with the Arduino. They focus on small LEDs and digital inputs, switches, a buzzer, and a servo. Lab-A2 will be introduce temperature sensors, analog joysticks, infrared remote control, and LCD displays.

# Part 1: Basic Interfacing

Download these files from D2L:

|  |  |
| --- | --- |
| Lesson | Code |
| *2.3 Digital Inputs.pdf*  *2.5 Active Buzzer.pdf*  *2.7 Tilt Ball Switch.pdf* | Digital\_Inputs.ino  active.ino  Ball\_Switch.ino |

Notes: The longer pin of the buzzer is the plus (+) terminal. Do **NOT** take off the sticker!

**► Perform Exercise 1 in the worksheet.**

# Part 2: Understanding Servo

Download these files from D2L:

|  |  |
| --- | --- |
| Lesson | Code |
| 2.8 Servo.pdf | Servo.ino |

Notes:

* A “servo” (short for servomechanism or servomotor) is a small electromechanical device that consists of a DC motor, gearing, and a control board. The motor shaft can be moved to a specific angle by sending the servo a coded signal.
* An SG90 Micro Servo is included in the kit. It looks like this:



The three wires connected to the servo are:

BROWN - Ground (GND)

RED - Vcc (+5 V)

ORANGE - PWM

* You can attach a plastic arm to the servo shaft.

**► Perform Exercise 2 in the worksheet.**

This section will be posted on D2L separately as Word document. Use that file to write your report. It is included here for completeness so that you have everything in one place.

**ECE 211 Lab-A1 – Worksheet**

**Exercise 1**

1. Follow the instructions in the lesson 2.3 Digital Inputs and run the code.
2. Next, do the activities from the lesson 2.5 Active Buzzer.
3. **Ask your Scrum Master to verify** that your setup is working for these two lessons.
4. Follow the instruction in the lesson 2.7 Tilt Ball Switch. It is a very short activity.

**Exercise 2**

This exercise has two subtasks:

1. First, do the lesson Servo exactly as written to get a functioning servo circuit. Look the code over carefully to see how it works.
2. Next, modify the servo code to incorporate components you used in the previous lessons. For example, instead of having the servo continuously swing back and forth by itself, make it a user-controlled action by adding a push button switch. You could also add some LEDs (remember to use 220 Ω resistors in series with them) to indicate the rotation state of the servo.
3. Once you are done, upload your modified Arduino servo program (.ino) to D2L.
4. **Ask your Scrum Master to verify** that your setup is working.
5. In the text box below, answer two questions:
   * How did you modify the servo code, i.e. which function did you add or modify? A couple of sentences will suffice.
   * Copy the code that corresponds to this modification / addition.
6. **Upload this completed worksheet with your name and answers on D2L**
7. **Upload your Exercise 2 Arduino .ino program to the Lab-A1 Submission Folder on D2L.**