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| **Arduino**  **Prototyping Protocol – 30 Pts** | **ID: PP-1** |
| **Due Date: 4/6/2020 11:59 PM, Canvas Upload** |  |

**Date Written –** 4/6/2020

**Date Revised –** 4/6/2020

**Author: Gabe Adriano, Seth Drake, Ian Garvin, Joseph Massey, Ruba Sus**

**Protocol Description – (Prototyping Protocol 1)**

This protocol describes the process for developing a MATLAB GUI for a prototype peristalsis pump to deliver pulses of fluid to cells in an incubator. The GUI must make a serial connection to the Arduino Uno that controls the pump and must allow the user to set the desired flow rate through the pump along with the diameter of the tubing.

To assemble pump, follow instructions in video “BIOE\_3090\_\_Arduino\_D5\_Part1.MP4” (CF3).

To assemble the circuit, follow instructions in video “BIOE\_3090\_\_Arduino\_D4\_Part3.MP4” (CF4).

**Tools and Equipment**

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| **ID** | **Tool** | **Name / # if applicable** | **Location** | **Purpose** |
| PT1 | Microcontroller Board | Arduino Uno | N/A | Pump control |
| PT2 | Stepper motor | P/N  17HS15-1504S-X1  S/N 190625000583 | N/A | Rotate pump head |
| PT3 | Stepper motor driver | A4988 Stepper Motor Driver | N/A | Connect stepper motor to PT1 |
| PT4 | Pump head | N/A | N/A | Push fluid through tube |
| PT5 | Pump casing | N/A | N/A | Supports the Pump head as the fluid is pushed through |
| PT6 | Laptop/Desktop | N/A | N/A | Run MATLAB |

**Materials**

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| **ID** | **Material** | **Purpose** |
| PM1 | Resistors | Prototyping circuit |
| PM2 | Capacitors | Prototyping circuit |
| PM3 | Wires | Prototyping circuit |
| PM4 | Breadboard | Prototyping circuit |
| PM5 | Tubing | Carries fluid through pump |
| PT6 | Fasteners and washers | Pump assembly |

**Computer Files**

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| **ID** | **FileName / Link** | **Purpose** | **Location** |
| CF1 | Arduino\_GUI.m | MATLAB file for GUI | SongOfTheStepperMotor.zip |
| CF2 | Arduino\_GUI.fig | MATALB figure for GUI | SongOfTheStepperMotor.zip |
| CF3 | BIOE\_3090\_Arduino\_D5\_Part1.MP4 | Pump assembly instructions | TechSmithRelay BIOE 3090 Course Files (thanks to Dr. Steve Lammers) |
| CF4 | BIOE\_3090\_\_Arduino\_D4\_Part3.MP4 | Circuit assembly instructions | TechSmithRelay BIOE 3090 Course Files (thanks to Dr. Steve Lammers) |
| CF5 | PP-1 | Prototyping Protocol | SongOfTheStepperMotor.zip |
| CF6 | TP-1 | Testing Protocol | SongOfTheStepperMotor.zip |
| CF7 | DCW-1 | Design Controls Worksheet | SongOfTheStepperMotor.zip |