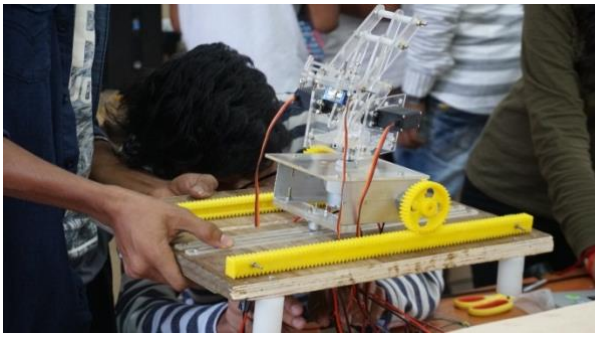
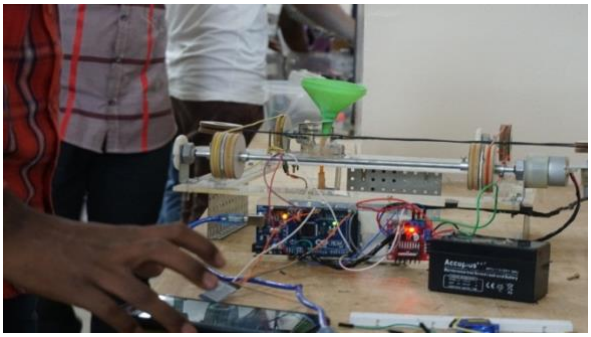
Platform Based Development

Kindly open this document in laptop/desktop only.

Introduction

Let us look at some projects done by the students of Engineering Exploration students.

Also have a look into projects done by your seniors here https://www.youtube.com/watch?v=C9QBjMoP3sY&t=3s

To create such Mechatronic systems we need knowledge related to Mechanical, Computing and Electronics. As a part of the Engineering Exploration course you will learn various knowledge and skills related to Mechanical, Computing and Electronics. **Arduino** is a development board which is used in Engineering Exploration course. These development boards along with IDE (Integrated Development Environment) offer electronics and computing capability to build Mechatronic systems.

What is Arduino?

Arduino is an open- source computer hardware and software company, project and user community that designs and manufactures microcontroller-based kits for building systems consisting of digital devices, interactive objects that can sense and control in the physical world. For further details visit Arduino official site: **https://www.arduino.cc/**

Watch this interesting Youtube video: **https://www.youtube.com/watch?v=9Xj3VuyoxOs**

If you learn Arduino you can also do similar projects and you will do one such project in Engineering Exploration.

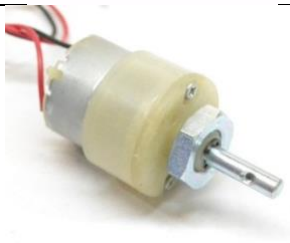
How to program Arduino?

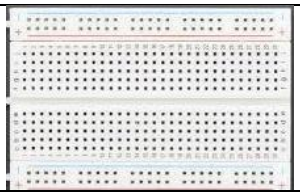
The Arduino Integrated Development Environment (IDE) supports the C and C++ programming languages using special rules of code organization. The Arduino IDE supplies a software library called "Wiring" from the Wiring project, which provides many common input and output procedures.

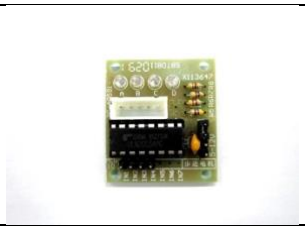
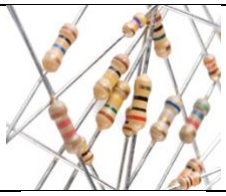
Download link for Arduino IDE: **https://www.arduino.cc/en/Main/Software**

Arduino starter kit

Each team should buy Arduino kit containing following items before 18-01-2020. Bring the kit to next session of Exploration after the 18-01-2020.

Sl. No	Component Name	Qty	Image
1	Arduino Mega 2560 + USB Cable	1	
2	IR sensor Module	1	
3	60 or 30 RPM DC geared motor	1	
4	2 Channel relay module	1	

5	Potentiometer 10k	1	
6	Breadboard 440 pts	1	
7	Wire stripper	1	
8	Single strand wire packet	1	
9	LED assorted color	10	
10	Toy servo SG90	1	
11	Stepper motor 28BYJ48 5 Volts	1	

12	Stepper motor driver module ULN2003	1	
13	Jumper wire Male to female and female to female	10 each	
14	12 Volt 2 Amp adapter	1	
16	Resistor Box	1	
17	Plastic box big enough to carry all above items.	1	
18	Screw terminal connectors	1	
19	Small screw driver (803 | 55 | 0 Phillips 3.5 x 0.5 mm)	1	

All components must be brought in the box (No.17 on the list). Write your team number on the box using a marker.

Let us learn basics of working with Arduino by soiling our hands.

Now that you have the Arduino kit ready with you, you will be learning about Arduino, its specifications and basic circuits using the links below. Please make sure that you are able to complete the working by the deadline specified.

Task No.	Content	Deadline
1	Connect PC with Arduino Board	21/1/2020
2	Save files in Arduino IDE	
3	Compile and upload the program/sketch in Arduino IDE	
4	Open serial monitor window	
5	Understand Program structure	
6	Significance of setup and loop in Arduino IDE	
7	Establish serial communication from Arduino to PC	
8	Configure the I/O pin as digital input	
9	Interface IR sensor with Arduino and check O/P in Serial monitor	
10	Configure the I/O pin as digital output	
11	Use delay function	
12	Interface DC Motor with Arduino using relay module	
13	Control DC motor with Arduino IDE	

Assignment 1: Write a program in Arduino IDE to control direction of DC motor based on IR sensor input.
(Hint: 1. https://www.arduino.cc/reference/en/language/structure/control-structure/if/)
(Hint: 2. https://www.arduino.cc/reference/en/language/structure/control-structure/else/)

Task No.	Content	Deadline
14	Establish serial communication from PC to Arduino	24/01/2020

Assignment 2: Write a program in Arduino IDE to control DC motor direction based on keyboard input.
(Hint: 1. https://www.arduino.cc/reference/en/language/structure/control-structure/if/)
(Hint: 2. https://www.arduino.cc/reference/en/language/structure/control-structure/else/)

Task No.	Content	Deadline
15	Configuring Analog Pins	27/01/2020
16	Interface potentiometer (analog device) with Ardunio and check output on serial monitor	

Assignment 3: Write a program in Arduino IDE to control DC motor direction based on potentiometer(POT) analog input.
Condition to be followed:
1.If POT value is **less than** 512 then motor should rotate in clockwise direction
2.If POT value is **greater than** 512 then motor should rotate in counter clockwise direction
(Hint: 1. https://www.arduino.cc/reference/en/language/structure/control-structure/if/)
(Hint: 2. https://www.arduino.cc/reference/en/language/structure/control-structure/else/)

Task No.	Content	Deadline
17	Interface Stepper Motors with Arduino using ULN2003 driver	31/01/2020
18	Interface Servo motor with Arduino	

Assignment 4: Write a program in Arduino IDE to change direction of stepper motor for every 3 seconds.

Assignment 5: Write a program in Arduino IDE to change servo motor position in the below mentioned sequence.

1. 0° to 90°
2. Delay for 1 second
3. 90° to 180°
4. Delay for 1 second
5. 180° to 90°
6. Delay for 1 second
7. 90° to 0°
8. Delay for 1 second

These assignments will be checked by your respective mentors during office hours.