

Syllabus

Day 1 (7/10/2019): Digital Inputs and Outputs

- Introduction to Raspberry Pi
Understand the difference between a standard computer and the Raspberry Pi (a single board computer)
- Introduction to Python programming language
We will use the Python programming language to program and interact with various low-level functionalities of the Raspberry pi. This topic covers the basic information needed to follow the logic of the Python programs (provided to you) tested in the workshop.
- Understand Raspberry Pi pinout
Like many peripherals available to you in a standard computer (USB, serial ports, etc.). In addition to USB ports and HDMI ports, Raspberry pi also provides low-level (hardware-level) functionality access in terms of digital input/output (IO) pins. This topic provides a high-level introduction what general purpose IO pins are.
- Blinking LED
We will build a simple circuit and control the blinking of a light emitting diode (LED).
- Control brightness of an LED
We will learn what pulse width modulation (PWM) is and how to control the brightness of and LED
- Detect switch (ON/OFF) interactions
Previous examples are automated, and the user has no control once the program starts running. Here, we will learn how we can command the program using a simple ON/OFF switch.
- Interface Raspberry Pi Camera
We will attach a camera to Raspberry pi and learn how to programmatically capture images and record videos.

Day 2 (7/11/2019): Using Sensors

Analog signals are continuous values whereas digital signals are binary. Raspberry Pi only understand binary signals, but many sensors use analog signals to measure physical quantities. This topic covers how we can use analog to digital conversion and measure various physical world quantities.

- Measure voltage
- Measure resistance
- Measure light intensity
- Measure temperature

Day 3 (7/12/2019): Using Actuators

Cyber-physical systems use not only various sensors but also actuators to affect physical world. The most common are (direct current) DC motors. This topic covers how we can use Raspberry pi to control the speed and direction of DC motors. Using these concepts, we will build and test a simple robot rover.

- Control speed of DC motors
- Control the direction of DC motors
- Make simple robot rover and control motion using keyboard inputs