Raspberry Pi Training Syllabus

This syllabus is designed in consideration of following objectives:

1) Hands-on learning experience with Raspberry Pi
2) IoT essentials introduction
3) Interfacing sensors and different modules with Raspberry Pi
4) Using Raspberry Pi to make electronic solutions
5) Use microcontroller beyond Arduino and ESP

Target Students : Students above 2nd Year of Engineering Undergraduate

Hours Per Session: ~ 3 hrs each session

Expected Students: ~ 60 students (2 Sessions)

Syllabus

01. Raspberry Pi Fundamentals, Setup and Installation

Objectives:

- Introduction to Raspberry Pi; drawing its parallels with familiar Microcontroller (in context to (electronics)students of IOE Purwanchal Campus)
- Introduction to different Models of Raspberry Pi
- History and Idea behind Raspberry Pi
- Installation of Raspberry Pi OS (Raspbian OS)
- Setting up Raspberry Pi via SSH/VNC
- Basic introduction of Raspberry Pi VNC interface.
- Linux Essentials

Activities:

- Flashing Raspberry Pi OS and First Boot
- Introduction to GPIO Ports of Raspberry Pi
- Accessing PI OS via VNC

02. Interfacing Sensors with Raspberry Pi

Objectives:

- Understanding Raspberry Ports and Pins in detail.
- Basic Interfacing of LED with Raspberry
- Interfacing some sensors like PIR sensors and Ultrasonic with Raspberry Pi
- Introduction to programming environment in Raspberry Pi
- Writing python commands to read data from sensors.
- Introduction to python libraries (RPi.GPIO)
- Sending data to **ThingSpeak**

Activities:

- Beginning with LEDs and buttons
- Using some popular sensors (PIRs, Ultrasonic) with Raspberry Pi and sending it's data to ThingSpeak
- Making some mini projects. (Motion Detection Alarm System etc.)

03. Raspberry Pi Camera (Image and Video Streaming)

Objectives:

- Connecting Raspberry Pi Camera with Raspberry Pi
- Controlling Camera and using image and video outputs.
- Python Camera Control
- Network Streaming of the Camera feed

Activities:

- Using Raspberry PI Camera with Raspberry Pi
- Camera Streaming over LAN
- Motion Triggered Image Capturing System

04. Introduction of IoT + IoT Concepts and IoT with Raspberry Pi

Objectives:

- Introduction to IoT Architecture
- Introduction of MQTT and using MQTT
- Data logging into databases (firebase or google sheets)

Activities:

- Using MQTT to communicate the data from the sensors to other devices.
- USING MQTT Protocol

05. Day 5: Building on top of IOT Concepts

Objectives:

- Integrating sensors + Camera + IoT system
- Data storage in cloud system
- REST API
- Building a simple dashboard with python Flask or some other frameworks
- Image processing
- Cloud Platforms like ThingSpeak

Activities:

- Making some system that integrates the use of sensors, camera and IoT system
- Using Flask or some other potential frameworks (Node Red UI) to make a dashboard

06. Final Projects and Way ahead

Objectives:

- Each Groups create their own system with Raspberry Pi

- What's beyond Raspberry Pi and IoT Concepts learned within the training – Experience Sharing Session

Activities:

- Each Groups make some system with Raspberry Pi and Final presentation

TOPICS to Cover:

- Installation and Setting Up Raspberry Pi OS
- GPIO Pins and interfacing sensors with Raspberry Pi
- Using Raspberry Pi camera
- MQTT with Raspberry Pi
- Flask Application / Connecting Pi with the Web
- Image processing with Raspberry Pi
- Other IoT based Applications

References:

Udemy Course:

https://www.udemy.com/course/raspberry-pi-for-beginners-step-by-step