

INTERNET OF THINGS LAB

Course Code: 20CS11S3

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Course Outcomes: At the end of the Course, the Student will be able to:

CO1: Build basic prototypes using Arduino Uno. (L3)

CO2: Use different types of sensors, actuators for Arduino Uno. (L3)

CO3: Demonstrate the setup and Installation procedure of Raspberry Pi.(L3)

CO4: Build prototypes using Raspberry pi with different communication protocols.(L3)

CO5: Design an interface using Tkinter to control the IoT devices.(L3)

LIST OF EXPERIMENTS:

1. Install IDE of Arduino and write a program using the Arduino IDE to blink LED.
2. Interface LED and buzzer with Arduino to buzz for a period of time.
3. Interface RGB LED with Arduino to obtain different colours and brightness using PWM.
4. a) Control a servo motor using Arduino with an input given through a push button (e.g: When the push button is pressed the servo motor has to rotate by 15 degrees).

b) Rotate Stepper motor either clockwise or anti clockwise at 'n' number of steps using Arduino.
5. Write a program to read the data from the RFID tag and display the information on the display board using Arduino and control LED (e.g: if it is a valid card then the LED should be ON otherwise OFF).
6. Control any two actuators connected to the Arduino using Bluetooth/Wifi.
7. Interface analog/digital sensors with Arduino and analyse the corresponding readings. (Sensors like temperature, alcohol, humidity, pressure, gas, sound pollution, level, weight, flow, proximity, LDR, PIR, pulse, vibration, sound etc..)
8. Demonstration of setup & working of Raspberry Pi. (Students have to prepare the report for the same).
9. Interface RGB LED with Raspberry Pi to obtain different colours and brightness using PWM.
10. a) Interface an ultrasonic sensor with Raspberry pi to print distance readings on the monitor when the sensor changes its position.

b) Reading the data from an analog sensor with Raspberry using Arduino serial port or ADC CP3208 using SPI.
11. Post/read the data to/from the cloud via MQTT broker with a Raspberry Pi.
12. Send real-time sensor data to a smartphone using Raspberry Pi onboard Bluetooth.
13. Interface Picamera module using Raspberry Pi to perform operations of PiCamera-API or OpenCV library.
14. Implement an intruder alert system that alerts through email
15. Implement remote monitoring of smoke alarm systems using Raspberry Pi.
16. Create a user interface using Tkinter to control the API's in Raspberry Pi.

Note: Any TWELVE of the experiments are to be conducted

DOMAIN-SPECIFIC USE CASES:

CHEMICAL ENGINEERING:

1. Monitoring a safe liquid level in a tank through IoT.
2. Sensing the concentrations of pollutants in air through IoT (CO₂ gas)
3. Measuring the presence of undesired material in an Industry effluent through IoT

COMPUTER SCIENCE AND ENGINEERING/ INFORMATION TECHNOLOGY:

1. Face Recognition System
2. Gesture Recognition System
3. Smart Farming System.
4. Health care system

ELECTRONICS AND COMMUNICATION ENGINEERING:

1. Automatic Traffic light system
2. Room automation system
3. Line follower robots

REFERENCES:

1. Vijay Madiseti and Arshdeep Bahga, *Internet of Things (A Hands-on-Approach)*, 1st Edition, VPT, 2016.
2. Richard Blum, *Arduino Programming in 24 Hours*, Sams Teach Yourself, Pearson Education, 2017.
3. Jain, Prof. Satish, Singh, Shashi, *Internet of Things and its Applications*, 1st Edition, BPB, 2020.
4. Donald Norris, *Internet of things_ do-it-yourself projects with Arduino, Raspberry Pi, and Beagle Bone Black*, 1st Edition, McGraw-Hill, 2015.
5. Adeal Javed Lake Zurich, Illinois, *Building Arduino Projects for the Internet: Experiments with Real- World Applications*, 1st Edition, USA, A press, 2016.
6. Yashavant Kanetkar, Shrirang Korde, *21 IOT Experiments*, 1st Edition, BPB Publications, 2018.
7. Dr. Rajesh Singh, Dr. Anita Gehlot, Dr. Lovi Raj Gupta, Navjot Rathour, Mahendra Swain, Bhupendra Singh, *IoT based Projects Realization with Raspberry Pi, NodeMCU and Arduino*,

1st Edition, BPB Publications, 2020.

WEB REFERENCES:

1. <https://www.arduino.cc/reference/en>
2. <https://create.arduino.cc/projecthub>
3. <https://maker.pro/raspberry-pi/tutorial>
4. <https://projects.raspberrypi.org/en/projects>
5. <https://www.digikey.com/en/maker/blogs/2019/how-to-use-mqtt-with-the-raspberry-pi>