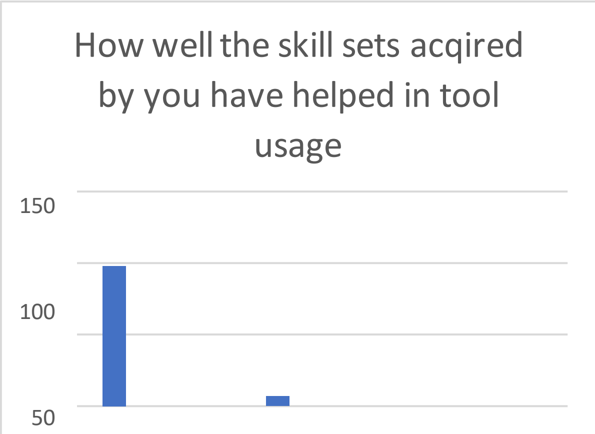
ANNEXURE 2.2.5

Impact analysis questions before modifications								
How was your experience during the internship	How well was the academics related to the internship work	The encouragement given to take initiative beyond the job requirement	How was the supervision and the supervisor's involvement in the work and clarifying of doubts	How well you have improved your skills during the internship	How would you rate the topics covered during the internship	How was your overall experience in the internship	Does the Internship has helped you in placement activities	Would you recommend this internship to the next batch of students

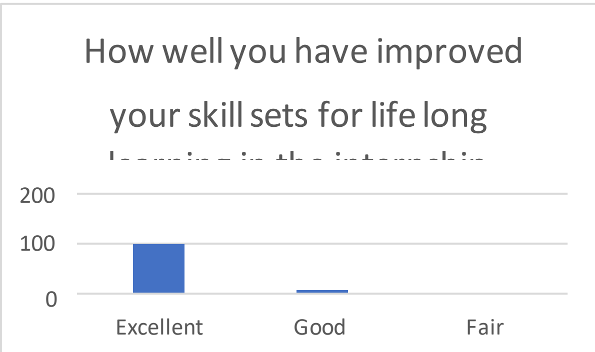
Impact analysis questions after modifications

Enter the values on scale of 1 to 3
Minimum 1
Maximum 3

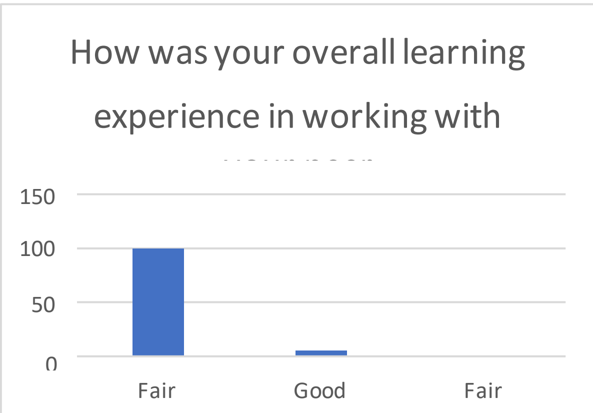
How was your learning experience during the internship	How well the skill sets acquired by you have helped you for contributing to the society	How well the skill sets acquired by you have helped in tool usage	How was the supervision and the supervisor's involvement in the work and clarifying of doubts	How well you have improved your skill sets for lifelong learning in the internship	your learning experience in acquiring new skill sets & documenting	How was your overall learning experience in working with your peer	Does the Internship have helped you in proving skill sets for lifelong learning

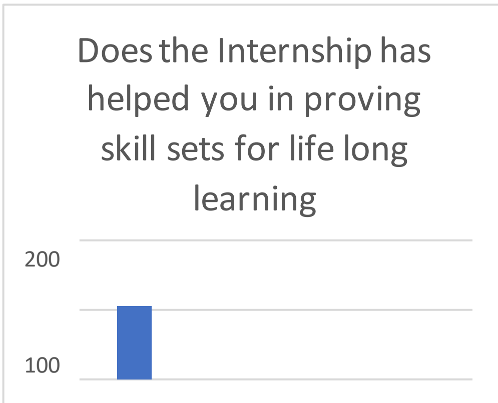

How well the skill sets acqired by you have helped in tool usage
150
100
50


How well you have
improved your skill sets for life long learning in the
150
100
50
Excellent
Good
Fair


How well you have improved
your skill sets for life long
200
100
0
Excellent
Good
Fair


Your learning experience
in acquiring new skill sets
200
100
Fair
Good
Fair


How was your overall learning
experience in working with
150
100
50
Fair
Good
Fair


Does the Internship has helped you in proving skill sets for life long learning
200
100

Cranes Varsity
'Where Technology Meets Excellence'

Internship Report on

"SMART CARD CONNECT"

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

Submitted by

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DAGGUPATI CHARITHA
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2022 - 2023

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The satisfaction and euphoria that accompany the successful completion of any task will be incomplete without the mention of the individuals, we are greatly indebted to, who through guidance and providing facilities have served as a beacon of light and crowned our efforts with success.

First and foremost, our sincere prayer goes to almighty, whose grace made us realize our objective and conceive this project. We take pleasure in expressing our profound sense of gratitude to our parents for helping us complete our internship successfully.

We would like to express my gratitude to **Cranes Varsity** for providing a very good and knowledgeable internship program.

We take this opportunity to express my sincere gratitude to our college **K.S. Institute of Technology,** Bengaluru for providing the environment to present the seminar.

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We also like to thank our Internship Trainer, **Ms. Rani Nanapu**, for his help and support provided to carry out this work successfully.

ABSTRACT

The project centers on the fusion of RFID technology and the ESP32 microcontroller, aiming to seamlessly integrate smart card functionality within the ESP32 ecosystem. RFID serves as the conduit for wireless communication between smart cards and the ESP32 platform, enabling bidirectional data transfer without physical contact. This amalgamation empowers the ESP32 to recognize, communicate with, and retrieve pertinent data from diverse smart cards equipped with RFID capabilities. Leveraging the robust processing power of the ESP32, the system efficiently interprets and processes the information stored within the smart cards' embedded chips. Consequently, this extracted data becomes pivotal in executing a spectrum of predetermined actions, ranging from secure access control mechanisms to facilitating seamless, contactless transactions and bolstering identity verification protocols. The project's core ambition lies in not only demonstrating the technical feasibility of this integration but also in showcasing its potential for revolutionizing numerous industries. Its applicability spans security systems, financial sectors, and identity management, offering a robust, scalable, and adaptable solution that champions secure, efficient, and versatile data exchange paradigms. Ultimately, this project aims to elucidate the transformative potential of combining RFID-based smart card connectivity seamlessly into the ESP32 framework, heralding a new era of intelligent, connected systems poised to address multifaceted challenges across diverse domains.

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LIST OF FIGURES

SMART CARD CONNECT

1.1 INTRODUCTION

RFID (radio frequency identification) is a form of wireless communication that incorporates the use of electromagnetic or electrostatic coupling in the radio frequency portion of the electromagnetic spectrum to uniquely identify an object, animal or person.

RFID tags are made up of an integrated circuit (IC), an antenna and a substrate. The part ofan RFID tag that encodes identifying information is called the RFID inlay.

An RFID Smart card is combined with an integrated circuit (or microchip) that is secured by a microcontroller. The card uses a direct or contactless frequency to establish a connection with the reader.

Smart cards provide a benefit to people with the right to privacy and give confidence to the users of organizations. It has wider advantages than traditional cards because they provide more features like security, reliability, and functionality.

RFID smart card technology is designed to enable applications like identification, access control, and contactless payment systems providing solutions for various sectors like healthcare, manufacturing, education, agriculture, etc.

For example, In the education sector, RFID smart cards are equipped with a chip and ID that is unique for every student. These smart cards are scanned by RFID readers, which can offer features like verifying their identity, and access control on the campus and wireless payments. Therefore, the smart card makes it easy for students to carry a single smart card rather than multiple cards or cash.

The read range for RFID tags varies based on factors including type of tag, type of reader,RFID frequency, and interference in the surrounding environment or from other RFID tagsand readers. These labels have an RFID tag embedded into an adhesive label and feature a barcode. They can also be used by both RFID and barcode readers. Smart labels can be printed on-demand using desktop printers, where RFID tags require more.

COMPONENTS REQUIRED:

- ESP-32
- RFID
- I2C-LED
- JUMPER WIRES

ESP-32 dev module :The ESP32-VROOM is a development module based on the ESP32, a versatile and powerful microcontroller designed by Espressif Systems. The ESP32- VROOM is widely used for prototyping and development due to itsopen-source nature, extensive documentation, and support from theThonny IDE and Espressif's ESP-IDF development framework.

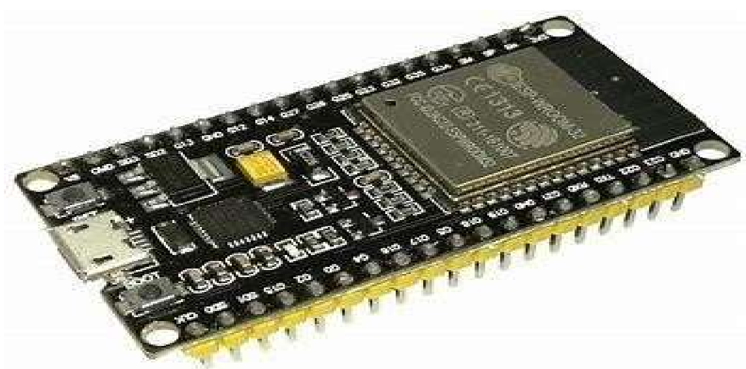

Fig 1.1 ESP-32

RFID(radio frequency identification): Radio Frequency Identification (RFID) is a technology that uses radio waves to passively identify a tagged object.

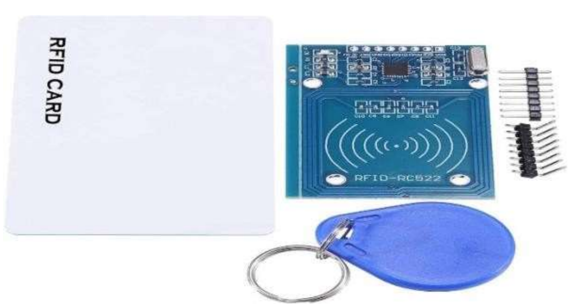

Fig 1.2 RFID

I2C_ LED: I2C LCD uses I2C communication interface to transfer the information requiredto display the content. tor weather conditions remotely. Users can access real-time data from

fig 1.3 I2C_LED

JUMPER WIRES: contíol the electíicity, stop the opeíation of the ciícuit, and opeíatea ciícuit that does not opeíate with oídinaíy wiping.

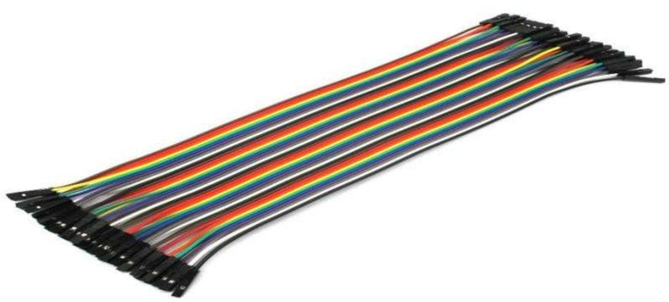

Fig 1.4 jumper wire

CIRCUIT DIAGRAM

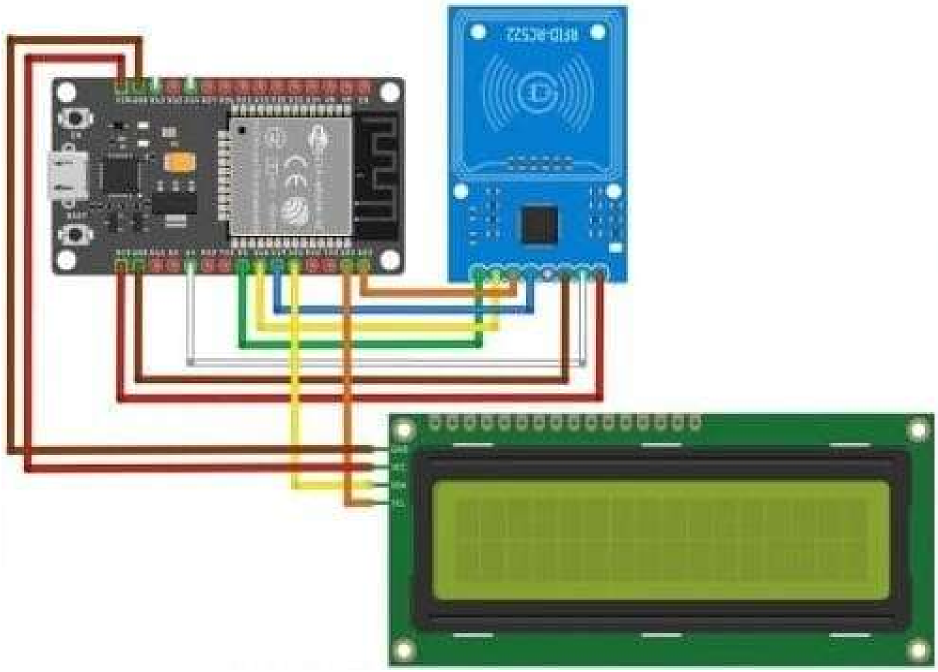

Fig 1.5 circuit diagram

CONNECTIONS:

MFRC522 RFID Module:

1.SPI interface (Serial Peripheral Interface) is used for communicatio

2.Connections to microcontroller:

3.SDA (Data) connected to a GPIO pin (e.g., GPIO 21 on ESP32)

4.SCL (Clock) connected to a GPIO pin (e.g., GPIO 22 on ESP32)

5.RST (Reset) connected to a GPIO pin (e.g., GPIO 4 on ESP32)

6.SS/SDA (Slave Select/Data) connected to a GPIO pin (e.g., GPIO 5 on ESP32).

I2C LCD Display:

I2C interface is used for communication. Connections to microcontroller:SDA (Data) connected to the microcontroller's SDA pin (e.g., GPIO 21 on ESP32)

SCL (Clock) connected to the microcontroller's SCL pin (e.g., GPIO 22 on ESP32).3.Power and Ground connections as needed.

Microcontroller (ESP32/ESP8266):

GPIO pins used for connecting to RFID module, I2C LCD, and potentially other purposes.Power and Ground connections.

WORKING:

1.Initialization:

- It initializes communication channels:
- I2C communication for the LCD display (i2c = I2C(scl=Pin(22), sda=Pin(21), freq=10000)).
- SPI communication for the MFRC522 RFID reader (spi = SPI(2, baudrate=2500000, polarity=0, phase=0)).
- Sets up the LCD display (lcd = I2cLcd(i2c, I2C_ADDR, totalRows, totalColumns)).

2.Card Detection Loop:

- The program enters an infinite loop (while True) to continually scan for RFID cards.
- It uses the rdr.request(rdr.REQIDL) method to detect if a card is present.
- Upon detecting a card (stat == rdr.OK), it retrieves the unique identifier of the card (raw_uid) using rdr.anticoll().

3. Card Identification and Display:

- Converts the raw_uid into a string format card_id (hexadecimal representation)
- Matches the card_id with predefined values and displays corresponding messages on the LCD:
- If the card ID matches a known ID ("uid: 0x7ac9ec80", "uid: 0x59e61818", "uid: 0x50007d14"), it displays specific messages like "Melon: $3", "Mango: $2", "Lychee: $5", respectively, on the LCD.
- If the card ID does not match any known IDs, it shows a default message "Strawberry: $10" on the LCD.

4. Display Duration:

- Eachdisplayed message remains on the LCD for 2 seconds (sleep(2)) before clearing the LCD to prepare for the next card detection cycle.

Specification/Features:

- Operating Voltage: 2.5V~3.3V.
- Working current: 13 – 26mA at 3.3
- Standby current: 10 – 13mA at 3.3V
- Operating Frequency: 13.56MHz
- Compatible with ISO 14443A and MIFARE 1K cards and key fob tags.
- Supports I2C-bus interface: In Fast mode Speed: up to 400 kBd, In High-speed mode: up to 3400 kB
- RS232 Serial UART Speed: up to 1228.8 kBd, with voltage levels dependent on pin voltage supply.
- Typical Operating Range: up to 50 mm in Read/Write mode, it depends on theantenna size and tuning.
- Working temperature：-20 to 80 degree
- Storage temperature：-40 to 85 degree
- Humidity：Relevant Humidity 5%—95%
- Board Dimension：40mm × 60mm

PROGRAM CODE:

```
From mfrc522 import MFRC522
From machine import Pin, I2C
From lcd_api import LcdApi
From i2c_lcd import I2cLcd
From time import sleep
From machine import SPI
I2C_ADDR = 0x27
totalRows = 2
totalColumns = 16
 i2c = I2C(scl=Pin(22), sda=Pin(21), freq=10000)    #initializing the I2C method for ESP32
#i2c = I2C(scl=Pin(5), sda=Pin(4), freq=10000)       #initializing the I2C method for ESP8266
lcd = I2cLcd(i2c, I2C_ADDR, totalRows, totalColumns)
spi=SPI(2,baudrate=2500000,polarity=0,phase=0)
spi.init()
rdr=MFRC522(spi=spi,gpioRst=4,gpioCs=5)
print("place card")
while True:
    (stat, tag_type) = rdr.request(rdr.REQIDL)
    if stat == rdr.OK:
        (stat, raw_uid) = rdr.anticoll()
        if stat == rdr.OK:
            card_id="uid: 0x%02x%02x%02x%02x"
%(raw_uid[0],raw_uid[1],raw_uid[2],raw_uid[3])
             print("UID:",card_id)
str_card_id = str(card_id)
                if str_card_id == "uid: 0x7ac9ec80":
                lcd.putstr("Melon: $3")
```

```
        sleep(2)
        lcd.clear()
    elif str_card_id == "uid: 0x59e61818":
        lcd.putstr("Mango: $2")
        sleep(2)
        lcd.clear()
    elif str_card_id == "uid: 0x50007d14":
        lcd.putstr("Lychee: $5")
        sleep(2)
        lcd.clear()
    else:
        lcd.putstr("Strawberry: $10")
        sleep(2)
        lcd.clear()
```

APPLICATION ON RFID:

1. It Increases Operational Efficiency:

One of the best benefits of RFID is that it requires less monitoring, which frees up employeesto handle other tasks and focus on more productive efforts. Additionally, it doesn't require any direct line of sight to read tags, meaning multiple tags can be read at one time. You can evenset up the RFID reader to automatically read tag data when you need it to.

2. Eliminates Human Error :

Manual labor always involves some level of risk for human error. With RFID, no human intervention is necessary to read data. It can all be automatically carried out by the reader. Thebenefits of RFID easily outweigh the costs. Not only does RFID save on labor, but it increasesaccuracy by eliminating the errors that come with manual data logging and product replenishment replenishment.

3.It Reduces Capital Costs:

The easiest way to keep costs low is to maintain tight control of your stock or assets, especially expensive business assets like test equipment, transport packing, computer tech, field vehicles, and more. If any of these suddenly disappear, replacing them could cost you significantly. RFIDprovides an easy and relatively inexpensive way to keep track of these assets.

4.It Grants Access to Real-Time Data:

The benefits of RFID go beyond freeing up employees. RFID offers reliable track-and-trace in tough environments. This technology can easily track and provide real-time data about inventory and product location. Whether you are tracking large asset inventory, individual products, or batches, you can benefit from automatic real-time data collections.

5.Offers Insights for Better Decision Making:

Real-time data can be analyzed to give you more insight for better decisions. RFID allows youto stay informed at all times, which comes in handy when it’s time to make planning and operational management decisions that can improve your profits.Easily access weather datathrough dedicated apps on smartphones, tablets, or computers. Moreover, the data collected by Wi-Fi-based weather stations can be shared with online weather networks or integrated intobroader environmental monitoring initiatives, contributing to a more extensive and collaborative understanding of weather patterns.

Advantages of RFID based on smart card connect:

1. **Convenience:** RFID technology enables wireless communication between the smart card and the reader, eliminating the need for physical contact. This contactless interaction streamlines processes, making it convenient for users to access information or services without inserting the card into a reader.
2. **Efficiency:** The quick communication between the smart card and the reader enhances operational efficiency. In scenarios like access control or payment systems, RFID-based smart card connections enable rapid authentication or transactions, reducing waiting times and increasing overall throughput.
3. **Security:** Smart cards often employ encryption and secure communication protocols, enhancing data security. The RFID-based smart card systems can incorporate encryption methods to safeguard transmitted information, reducing the risk of unauthorized access or data interception.
4. **Durability and Longevity:** Smart cards are robust and durable due to their construction, which protects the embedded microchip from physical damage. This durability ensures that the cards have a longer lifespan, making them suitable for long-term use in various applications.
5. **Versatility:** RFID-based smart cards can store various types of data, from basic identification information to more complex data sets like access permissions or financial credentials. This versatility allows their use in a wide range of applications, including access control, public transportation, payments, and more.
6. **Scalability:** These systems are often scalable, allowing for the integration of additional functionalities or the expansion of the system's capabilities without significant modifications. This scalability makes RFID-based smart card connections adaptable to evolving needs and future enhancements.
7. **User-Friendly Interface:** The contactless nature of RFID-based smart card systems offers a user-friendly experience. Users simply need to bring the card within range of the reader for communication, eliminating the need for manual swiping or insertion, thereby simplifying interactions.

APPLICATION BASED ON SMART CARD CONNECT:

1. **Access Control Systems:** Smart card connections are extensively used in access control for buildings, offices, and secure areas. Employees or authorized personnel can use smart cards to gain entry by simply tapping or placing the card near a reader, providing secure and convenient access.
2. **Public Transportation:** Many public transportation systems utilize smart card connections for ticketing and fare collection. Passengers use smart cards to quickly and conveniently pay for rides, reducing queues and streamlining the boarding process.
3. **Financial Transactions:** Smart card connections play a significant role in financial transactions. Debit and credit cards often use smart card technology to securely store account information, enabling secure transactions at ATMs, POS terminals, and online purchases.
4. **Identity Verification and Authentication:** Smart cards serve as a means of identity verification in various settings, including government-issued ID cards, employee badges, and healthcare cards. They securely store personal data, ensuring reliable authentication.
5. **Healthcare Systems:** Smart card connections are used in healthcare for patient identification, storing medical records, and managing access to sensitive information. These cards enhance privacy and security in handling medical data.
6. **Hotel Key Cards:** In the hospitality industry, smart cards function as hotel room key cards, enabling guests to access their rooms securely without physical keys.
7. **Library or Educational Institutions:** Smart cards are used in educational settings for library access, student identification, and campus services, providing secure and efficient access to resources and facilities.
8. **Event Ticketing and Access:** Smart cards are employed in event management for ticketing and access control at concerts, conferences, and sports events, facilitating quick and secure entry for attendees.
9. **Parking Access Control:** Smart card connections are used in parking systems for access control and payment processing, offering convenient and secure parking solutions in both commercial and residential settings.

CONCLUSION :

In conclusion, RFID-based smart card connections represent a pivotal technological innovation offering a seamless, secure, and versatile solution across a multitude of industries. Their contactless nature streamlines processes, ensuring efficiency and convenience for users in diverse applications. The amalgamation of RFID technology with smart cards has revolutionized access control, transportation, financial transactions, and identity verification, among other sectors. These systems provide robust security measures, leveraging encryption and authentication protocols to safeguard sensitive data during communication. With their durability, scalability, and ability to store various types of information, RFID-based smart card connections stand as a reliable and adaptable solution for present needs while demonstrating potential for further enhancements and integrations. Overall, these systems underscore a transformative paradigm in modern connectivity, offering a harmonious blend of security, efficiency, and user-friendly interaction.

REFERENCES:

EEE Xplore (https://ieeexplore.ieee.org/): Provides access to numerous research papers and articles on RFID technology and smart card applications.

GitHub www.github.com – library files

Chat GPT www.openai.com

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IOT Edge and Gateway

Duration– 15days

Objectives

- Understanding the concept of IOT
- To gain an understanding of Internet of things using python features and their uses in developing applications.
- Understand the internals of Internet of things by connecting node devices to gat way and gateway devices to cloud and by collecting things data.
- Analyzing the data and act upon the data from the cloud.
- Exposure to technologies used in building an IOT solution

Takeaway

- Explore Raspberry-pi with Python scripts
- Discover how to work with Internet of things
- Interfacing sensors with Raspberry-pi
- Analyze the data and work with cloud
- Use Raspberry pi as a server to control the things
- Master the fundamentals of IOT by building project

Pre-requisites

- Basic programming and Hardware knowledge
- Basic knowledge of Python
- Basic knowledge of Microcontrollers
- Basic knowledge of Linux

Hardware and Software tools

- RaspberryPi3+micro-USBcable
- Internet connectivity and Ethernet cable
- USB keyboard and mouse
- Monitor, HDMI to Serial converter
- Windows 7(or higher) system to download andportRaspberryPiOSonRaspberryPi3

Day1:

Introduction to Python

- Using Python Interpreter
- Python script file
- Print Message to Standard Output
- Variables and data types
- Reading Input from console
- Type Conversion
- Arithmetic Operators and Conditions

Day2:

Control Flow

- Relational Operators
- if...else statement
- Logical operators
- While Loops
- Break and continue statement
- Loops with else statement
- Pass statement
- Python for loop
- Range Function

Day3:

Lists and Tuples

- Creating List
- Accessing elements from List
- Inserting and Deleting Elements from List
- List Slicing
- Joining two lists
- Repeating sequence
- Nested List
- Built-in List Methods and Functions

Day4

- Searching elements in List
- Sorting elements of List
- Shallow and Deep copy
- List Comprehensions
- Conditionals on Comprehensions
- Tuples and its functions

Day5:

Set and dictionary

- Creating a Set
- Adding and removing elements from set.
- Python set operations
- Creating a Dictionary
- Accessing elements of Dictionary
- Adding elements to Dictionary
- Deleting elements from a dictionary
- List as values of Dictionary
- Nested Dictionary.

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Day6 :

Functions

- Defining Functions in Python
- Function Argument
- Single Parameter Functions
- Function Returning single Values
- Functions with multiple parameter
- Function that return Multiple Values
- Functions with Default arguments
- Named arguments
- Scope and Life time of Variables
- Global specifier

Day7 :

- Functional programming tools: map(), reduce() and filter()
- Lambda: short Anonymous functions
- Creating and importing modules
- Programming Examples & Assignments
- Recursion

Day8 :

Introduction to IOT

- What is IOT?
- Why do we need IOT?
- How does IOT work?
- IOT Architecture- Components of IOT
- How Does an IoT Gateway Device Work?

RASPBERRYPI

IntroductiontoRaspberryPi3modelB Raspbian OS:

- Setting up Raspbian OS on SD card
- Raspberry Pi hardware setup
- Basic Raspbian OS commands

Day9:

Raspberry pi GPIO programming.

Working with GPIO

- Flashing an LED
- Interfacing LCD
- Developing LCD package in python

Day10:

Interfacing Sensor to RPi

- InterfacingDHT11sensortoRpi
- Interfacing LDR Sensor to RPi

Day11:

- Interfacing ultrasonic distance Sensor
- Interfacing PIR Sensor
- LCD Interfacing with sensors

Day12:

Cloud Computing

- Connecting to cloud
- Creating Thing speak account
- RESTAPI
- Using Thing Speak API to upload data to cloud
- Connecting using MQTT

Day13:

Setting RPi as a server

- Setting RPi as a http server
- Installing the packages to setup server
- Hosting the server
- Creating the Web pag

Day14:

Mail transfer through SMTP

- Introduction to SMTP
- Configuring smtp configuration file (ssmtp.conf)
- Sending messages through email

Day15:

Mini Projects:

- Home Automation
- Smart Agriculture Farming
- Remote Health monitoring

Note: Coverage of the topics and Projects mentioned will be strictly based on the student's learning ability and time.

There will be assignments on every peripheral and enough hands on will be given with strong programming knowledge.

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