C. V. Raman Global University
ODISHA BHUBANESWAR INDIA

Phytec Embedded Private Limited

Internship Coursework Presentation

C. V. RAMAN GLOBAL UNIVERSITY, Bhubaneshwar

Outline

- ✓ **Internship Details**
- ✓ **Domain of Work**
- ✓ **Tools/Software/System Using/Learning**
- ✓ **Methodology/Blueprint/Approach/Procedure**
- ✓ **Additional Courses Done during Internship**
- ✓ **Implementation/Results/Analysis/Discussion**
- ✓ **Conclusion/Remark**
- ✓ **Learning Outcome**
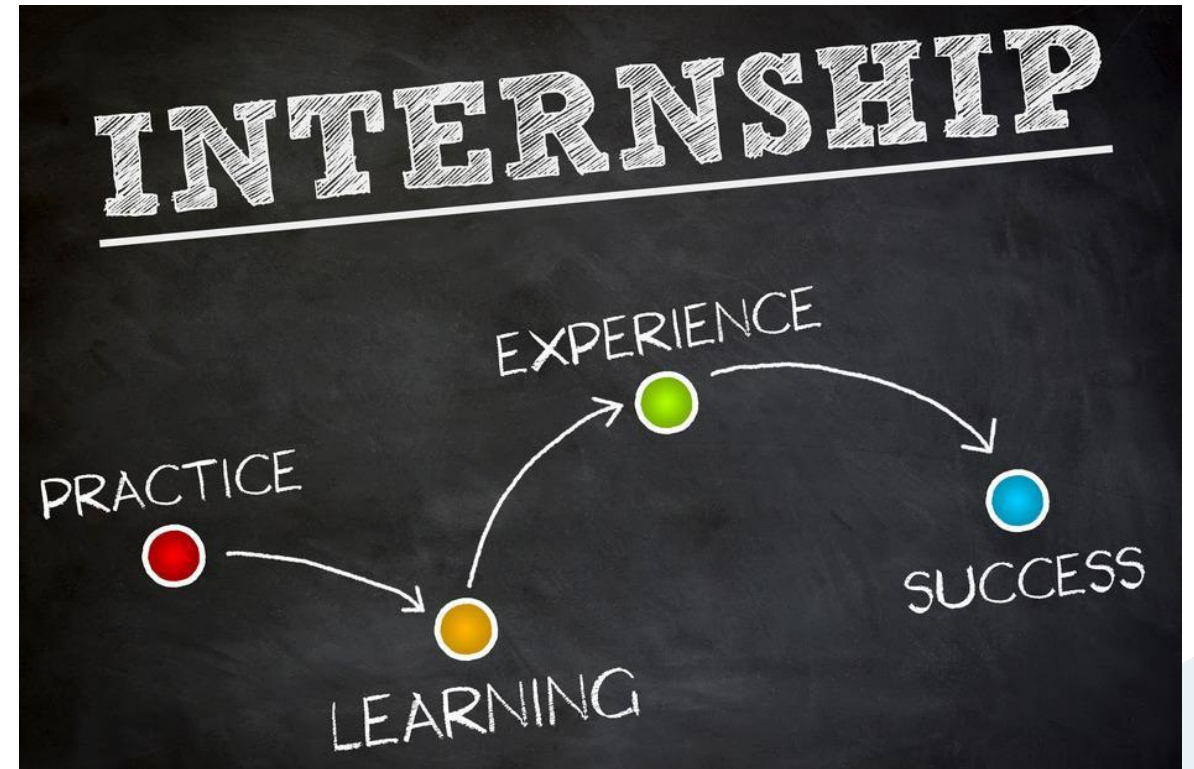
ABOUT COMPANY

Phytec Embedded Private Limited

- PHYTEC develops and manufactures System on Modules (SoM) or Computer on Modules (CoM), Single Board Computers (SBC), IoT Kits & Product Solutions (IoT Gateway, APOS /LPOS) for the global embedded market. PHYTEC also develops Linux, Android & Windows Embedded software Board Support Packages (BSPs) in support of leading 32-bit microprocessors; including: ARM, Intel Atom and PowerPC.

- PHYTEC has three module concepts based on different market requirements. For all module concepts, the microcontroller modules based on Cortex-A17, Cortex-A15, Cortex-A9, Cortex-A8, Cortex-A7, Cortex-A5, ARM9, ARM11, Cortex-M3 controllers .

- Incorporated in the year **1986**, **Phytec Embedded Private Limited.**

- The head office of our business is located in **Bengaluru, Karnataka**.

Internship Details

Company Name: Phytec Embedded Private Limited	**Mode of Operation : OFFLINE**
Program: B-Tech	**Semester: 8th**
Company Joined: Phytec Embedded Private Limited	**Type of Internship: ON JOB TRAINING**
Duration of Work: 8 Hours	**HR/Supervisor/Mentor Name: P.GOPAL KRISHNA**
Daily Contact Hour and Number of Days a Week: 9 hours a day/ 5 days a week	**Place: SDI,Bhubaneshwar**

Domain of Work (Aim or Objective):

**It is a 6 month Internship program with 6 modules for each month.

Module 1 : Embedded C Programming.   240hrs
Module 2 : ARM MCU Programming.   232hrs
Module 3 : Linux Internals.   240hrs
Module 4 : Embedded Linux Porting.   232hrs
Module 5 : Linux Device Drivers.   240hrs
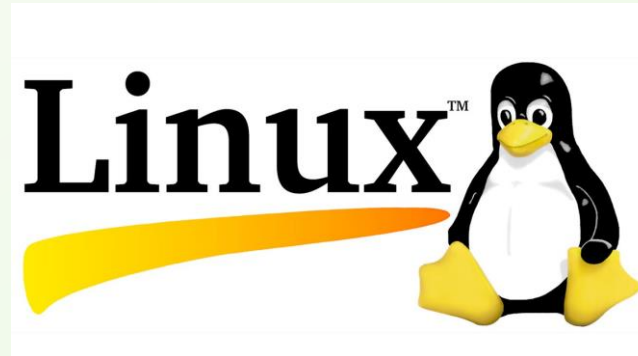Module 6 : YOCTO.   240hrs

Tools/Software/System Using/Learning:

1. LINUX

2. STM32 CUBE IDE

3. KIKAD

4. VS CODE

Methodology/Blueprint/Approach/Procedure:

- During internship period in Phytec I learnt Embedded C (from basic to advance) in module 1.

- In 2nd Module I learnt about MICROCONTROLLERS specifically we used STM32F446RE .
- Using this microcontroller we did GPIO Programming and various INTERFACING ex:- SPI ,I2C ,USART.

- Coming to module 3 I learn Linux Internals ,As module 3 basically Iot part like socket programming .
- In this module I learned mostly about linux and serial communication .

- As our internship is going on till now upto Module-3 we have completed successfully and rest 3 Module I will be completing in coming 3 months.

DEPARTMENT OF ELECTRONICS AND TELECOMMUNICATION ENGG

PROJECT DURING INTERNSHIP
On
BILLING SYSTEM using STM32F446RE

Under the Guidance of: P.GOPAL KRISHNA

SUBMITED BY:-
Deepak Kumar Beniya

STM32F446RE MICROCONTROLLER

- The STM32F446RE is a 32-bit microcontroller from STMicroelectronics based on the ARM Cortex-M4F core.

- It is part of the STM32F4 series of microcontrollers, which are designed for high-performance applications.

FEATURES OF STM32F446RE

- **Core:** The microcontroller is based on the ARM Cortex-M4F core, which includes a floating-point unit (FPU) and DSP instructions, making it well-suited for applications that require high-performance computation.

- **Clock Speed:** The STM32F446RE has a maximum clock speed of 180 MHz, which allows for fast execution of instructions.

- **Memory:** The microcontroller has 512 KB of flash memory and 128 KB of SRAM, which provides ample space for program code and data.

- **I/O Peripherals:** The STM32F446RE has a range of built-in peripherals for interfacing with the external world, including:

❑12-bit ADC with up to 16 channels

❑2x DAC

❑4x USART, 3x SPI, and 3x I2C interfaces

❑2x CAN controllers

❑10x timers, including 2x 32-bit timers and a motor control timer

- **Low Power Consumption:** The STM32F446RE includes several features to reduce power consumption, including power-saving modes, clock gating, and low-power peripherals.

- **Connectivity:** The microcontroller includes a USB 2.0 full-speed device/host/OTG controller, which allows it to communicate with a wide range of external devices.

- **Security:** The STM32F446RE includes hardware-based security features, such as a CRC calculation unit and a true random number generator, to ensure the integrity of data and code.

- The STM32F446RE is a **high-performance** microcontroller with a range of features that make it suitable for a wide range of applications, including industrial control, motor control, and consumer electronics.
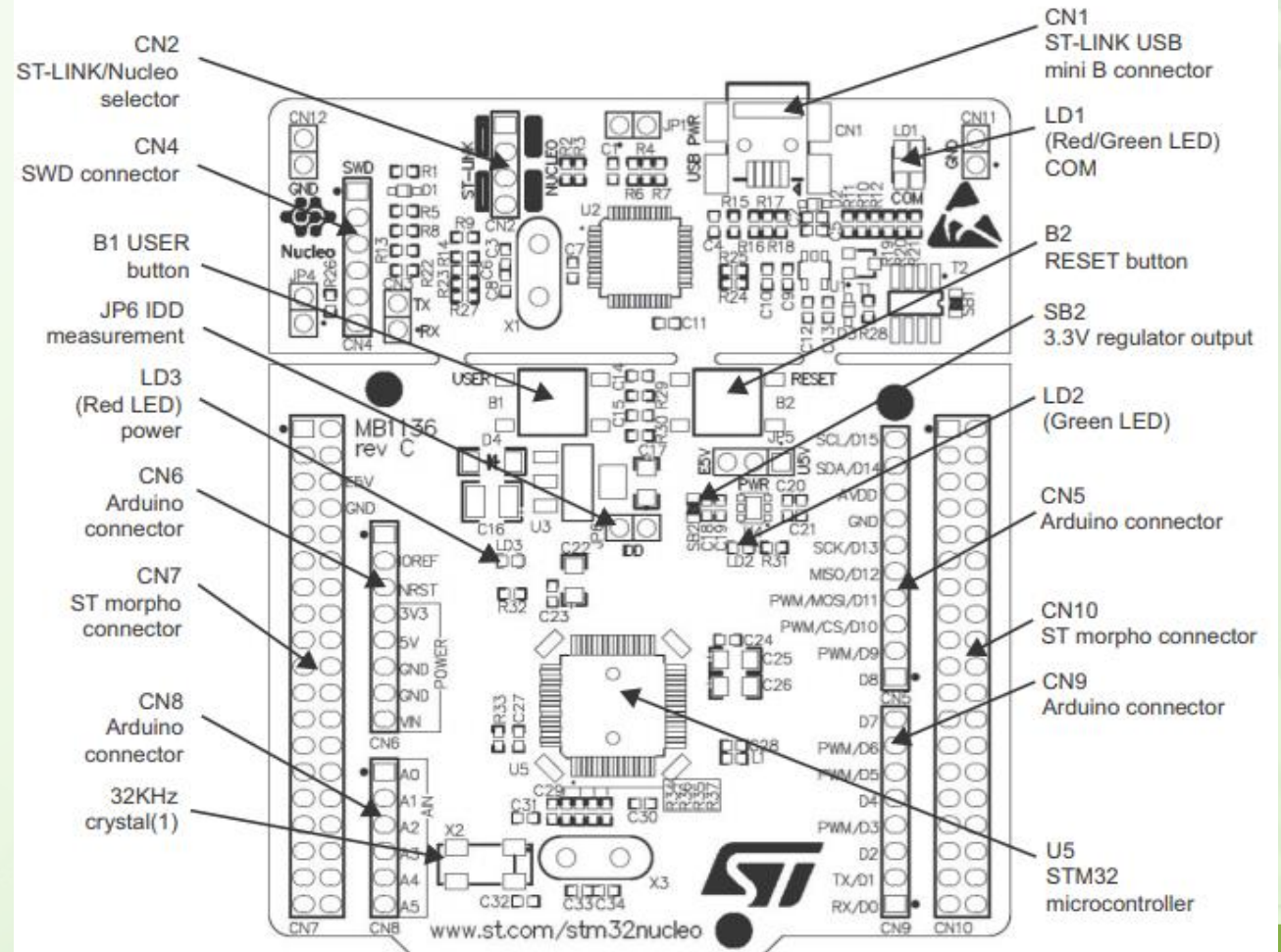

Microcontroller applications
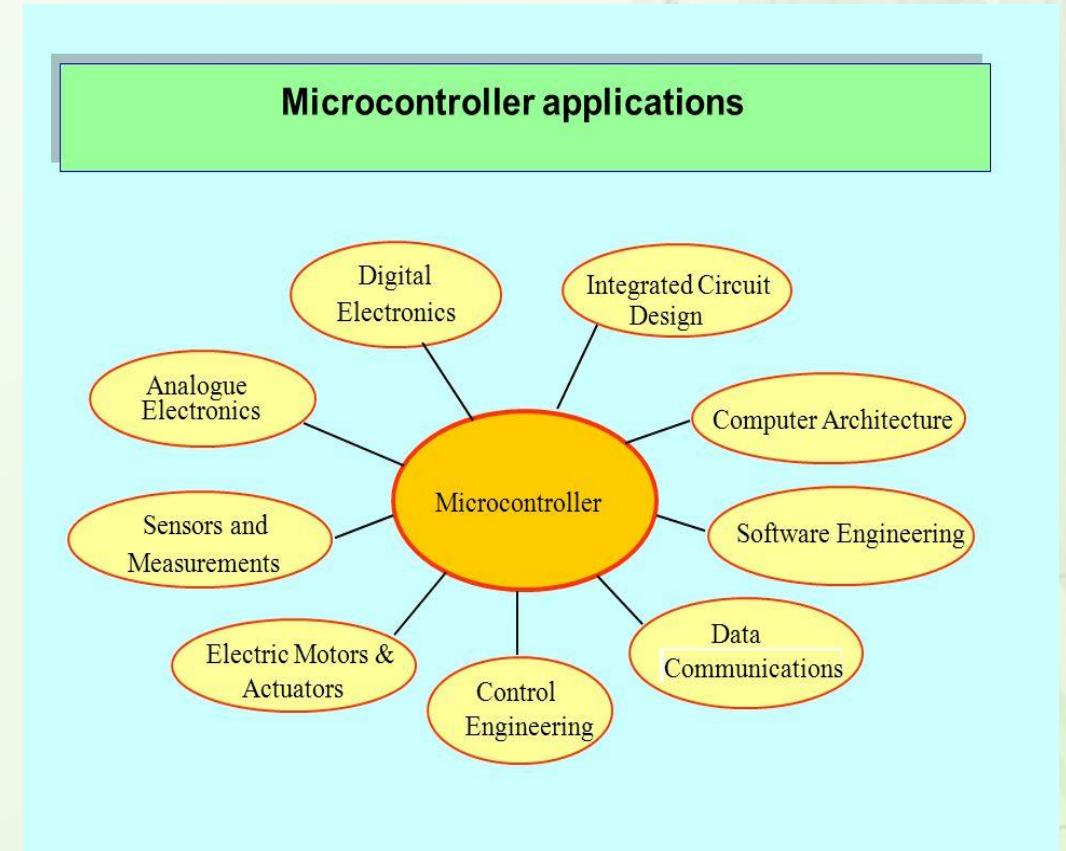
NUCLEO BOARD
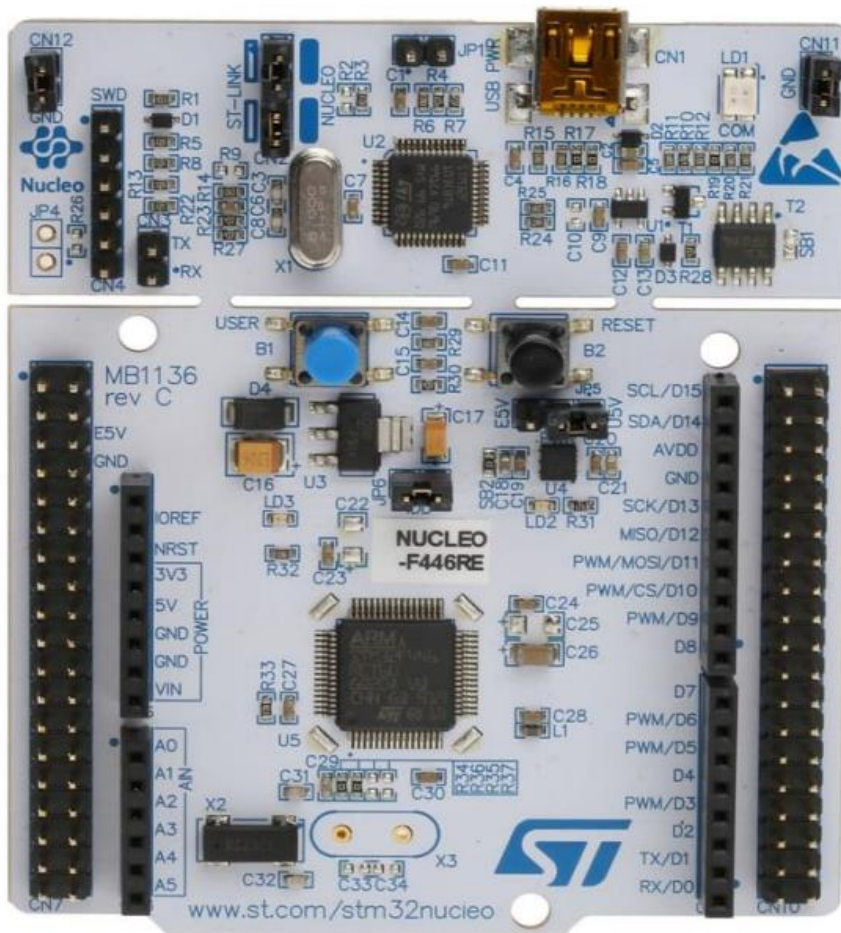
RFID

- RFID is an abbreviation for "Radio-Frequency Identification" and refers to a technology whereby digital data encoded in RFID tags are captured or identified by a reader via radio waves
- EM18 RFID Reader is a module which reads the ID information stored in RFID TAGS.

Features :-
- Operating Voltage: 5V DC Supply
- Read frequency: 125 kHz.
- Reading Distance: 6-10 cm

Application :-
- Smart Access Control System.
- Card Based Entry System.
- Attendance System.
- DIY projects requiring need for RFID based System
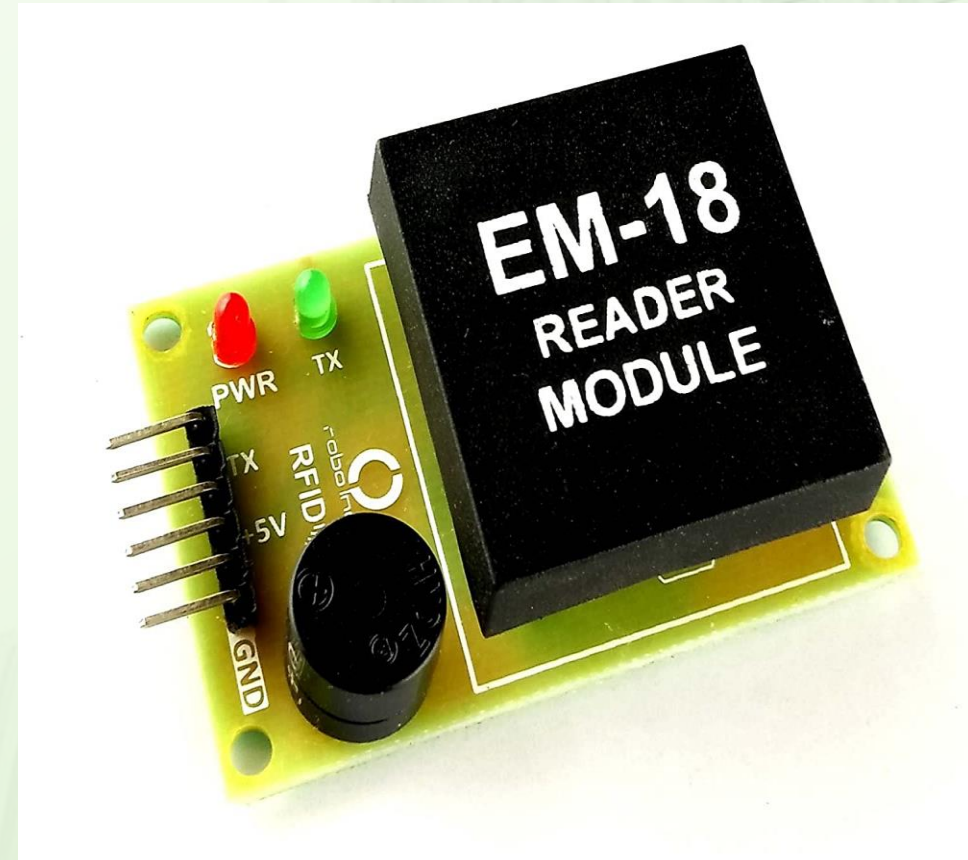
KEYPAD

A 4x4 keypad has a total of 8 connections, where 4 of them are connected to the column and the remaining rows of the matrix of switches. When an individual button is pressed, a connection is established between one of the rows and columns.

Specifications:-
Maximum Voltage rating -24V DC
Numbers of Pin -8
Maximum Current rating - 30 Ma

Application:-

❑ Data entry for microcontroller
❑ Menu or data selection
❑ Password lock

OLED

OLED (Organic Light-Emitting Diode) is a self light-emitting technology composed of a thin, multi-layered organic film placed between an anode and cathode. In contrast to LCD technology, OLED does not require a backlight. OLED possesses high application potential for virtually all types of displays and is regarded as the ultimate technology for the next generation of flat-panel displays.
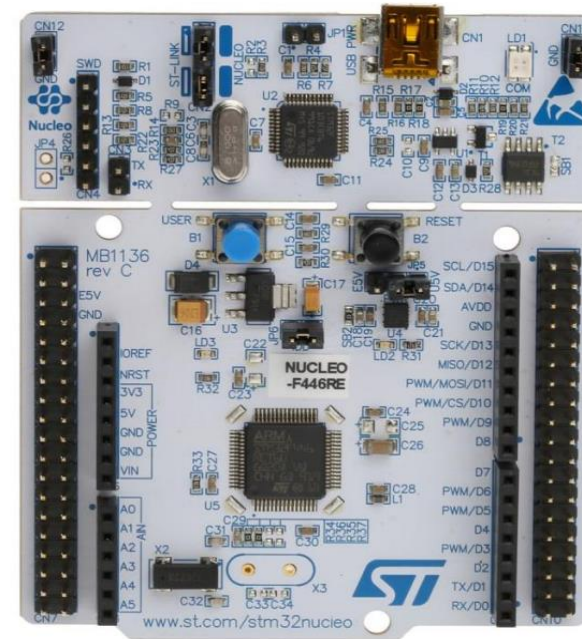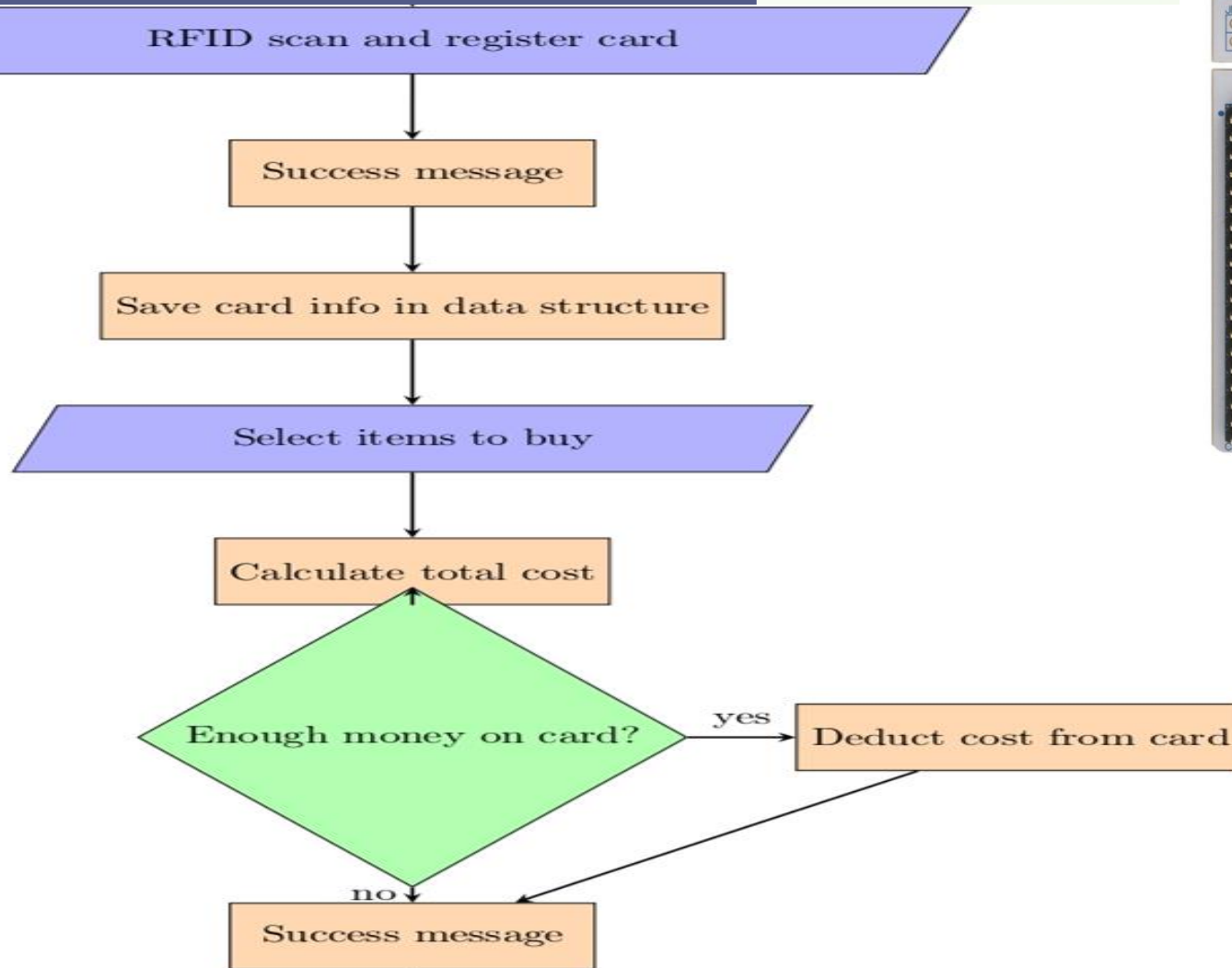
Features:-
- Power Supply-2.8V
- Operating Temperature--30℃~70℃
- Display Format-128x64 Pixels (Dots)

Application:-
- Displays:
- Lighting
- Medical Devices:

RFID scan and register card

↓

Success message

↓

Save card info in data structure

↓

Select items to buy

↓

Calculate total cost

↓

Enough money on card? — yes → Deduct cost from card

no ↓

Success message

WORKING PRINCIPLE

We made product with this prospective ids:-

- These product were scanned in rfid.

- In OLED display the product with the price will be shown.

- To increase item or to set no of items, to handle this situation we use keypad interfacing .

- We are also use RTC to set time and date in display.

- We did all this Interfacing using STM32F446RE which I taught in internship period.

RESULT

Finally in OLED display the product with th total price is shown

CONCLUSION

A well-implemented billing system enhances the overall customer experience by providing clear and transparent invoices. It enables businesses to deliver accurate product , reducing customer disputes and enhancing customer satisfaction.