ECE663:EMBEDDED SYSTEMS WITH MICROPYTHON

L:3   T:0   P:2   Credits:4

Course Outcomes: Through this course students should be able to

CO1 :: outline the basic elements ESP32 board

CO2 :: apply basic knowledge of MicroPython programming for ESP32

CO3 :: develop various modules by interfacing different peripherals with ESP32

CO4 :: integrate the different external devices for creating real world applications

CO5 :: analyze the various communication protocols supported by ESP32

CO6 :: design the ESP32 based system for real time problems

Unit I

Introduction to Embedded Systems : what is an embedded system, characteristics of embedded system, applications of embedded systems

Introduction to ESP32 boards and MicroPython : overview of ESP32 boards, ESP32-WROOM-32 specifications, features and pin description, modules and functions integrated in ESP32-WROOM-32, introduction to MicroPython, Python versus MicroPython, MicroPython programming basics

Unit II

Introduction to Micropython Programming : introduction to MicroPython, Python versus MicroPython, MicroPython IDEs, variables and data types, conditional structure, while loop, for loop, functions, arrays

Unit III

uPyCraft IDE for ESP32 and usage of ESP32 GPIO's : installation and getting started with uPyCraft IDE, download and flashing MicroPython firmware to ESP32, running your first script, interacting with GPIO's, usage of ESP32 touch pins

Unit IV

Interfacing output devices and actuators : seven segment display interfacing, I2C LCD interfacing with ESP32, servo motor interfacing and control with potentiometer, working with DC motor (L298N motor driver), OLED interfacing

Unit V

Interacting with analog and digital pins of ESP32 : digital inputs and digital outputs, programming internal ADC, programming ESP32 PWM, controlling ESP32 PWM with ADC

Unit VI

Sensors interfacing with ESP32 : infrared sensor interfacing with ESP32, PIR sensor interfacing for motion detection, temperature sensor (DHT11) interfacing, ultrasonic sensor (HC-SR04) interfacing for distance measurement

Futuristic Technologies : artificial intelligence, human computer interfaces, machine learning, image processing

List of Practicals / Experiments:

List of Practical's

- interfacing LED for blink and brightness control
- seven segment display interfacing
- interfacing I2C LCD
- controlling servomotor with ESP32
- controlling DC motor with ESP32
- IR and PIR sensors interfacing
- temperature sensor interfacing
- interfacing ultrasonic sensor with ESP32
- pushbutton and potentiometer interfacing

- OLED interfacing

Text Books: 1. PROGRAMMING WITH MICROPYTHON: EMBEDDED PROGRAMMING WITH MICROCONTROLLERS AND PYTHON by NICHOLAS H. TOLLERVEY, O'REILLY

References: 1. PYTHON FOR MICROCONTROLLERS: GETTING STARTED WITH MICROPYTHON by DONALD NORRIS, M.G.Hills

2. MICROPYTHON PROJECTS: A DO-IT-YOURSELF GUIDE FOR EMBEDDED DEVELOPERS TO BUILD A RANGE OF APPLICATIONS USING PYTHON by JACOB BENINGO, PACKT PUBLISHING