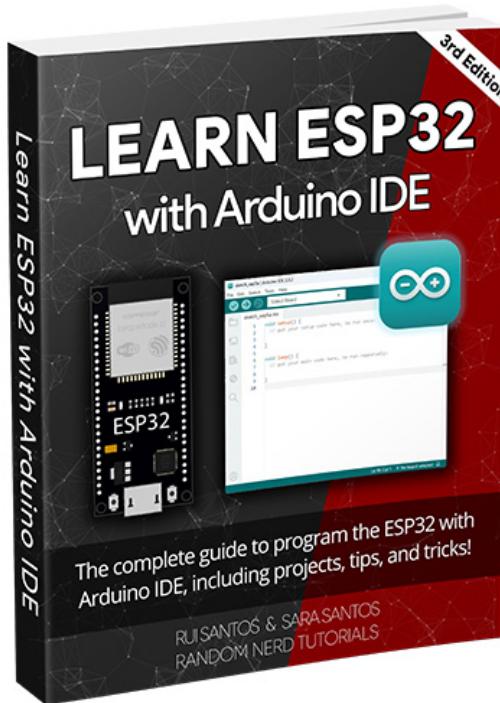


# Learn ESP32 with Arduino IDE (eBook)

(3rd Edition)

This is a practical eBook where you'll learn how to take the most out of the ESP32 using the Arduino IDE. This is our complete guide to program the ESP32 with Arduino IDE, including projects, tips, and tricks!



**GET THE EBOOK »**

## What's inside the eBook?

The eBook contains 10 Modules to take the most out of the ESP32. We'll start by introducing the ESP32 main features and explore its GPIOs. We'll also cover a variety of subjects related to IoT like Web Servers, Bluetooth Low Energy (BLE), MQTT, LoRa, and ESP-NOW. Each subject contains practical examples with schematics and code.

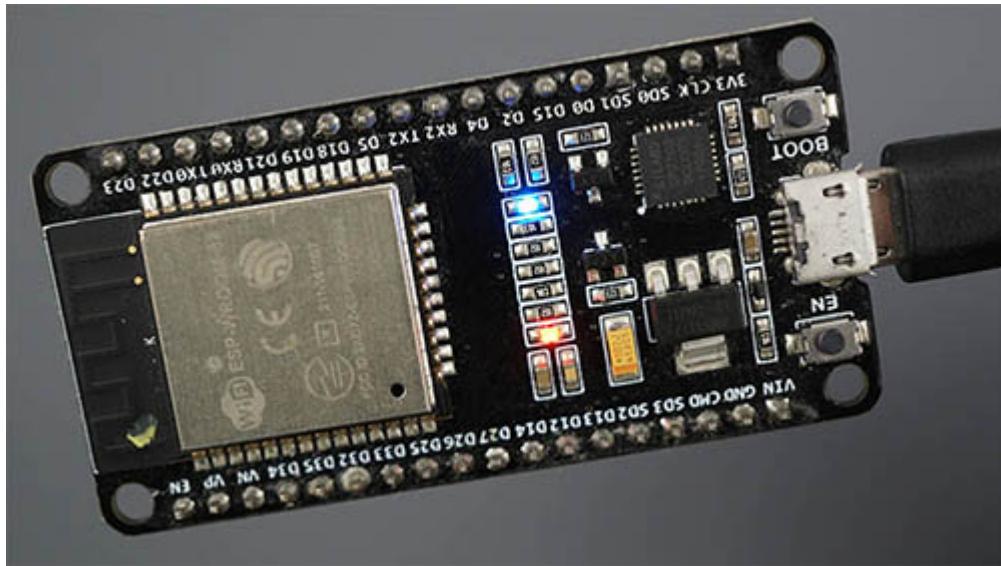
**Here's what you'll have access:**

- All 10 Modules (downloadable eBook in PDF format with 810 pages)
- Includes 4 advanced ESP32 Projects
- Source Code + Full Schematics
- Unlimited Updates
- Exclusive access to a private Forum to ask questions
- Exclusive access to our Facebook group community

# Table of Contents

The first 10 Modules cover the main ESP32 concepts like analog inputs, PWM, digital outputs, timers, touch pins, interrupts, and much more; You'll also learn about deep sleep, building web servers (with Wi-Fi), experiment with Bluetooth Low Energy (BLE), MQTT, use LoRa technology and ESP-NOW.

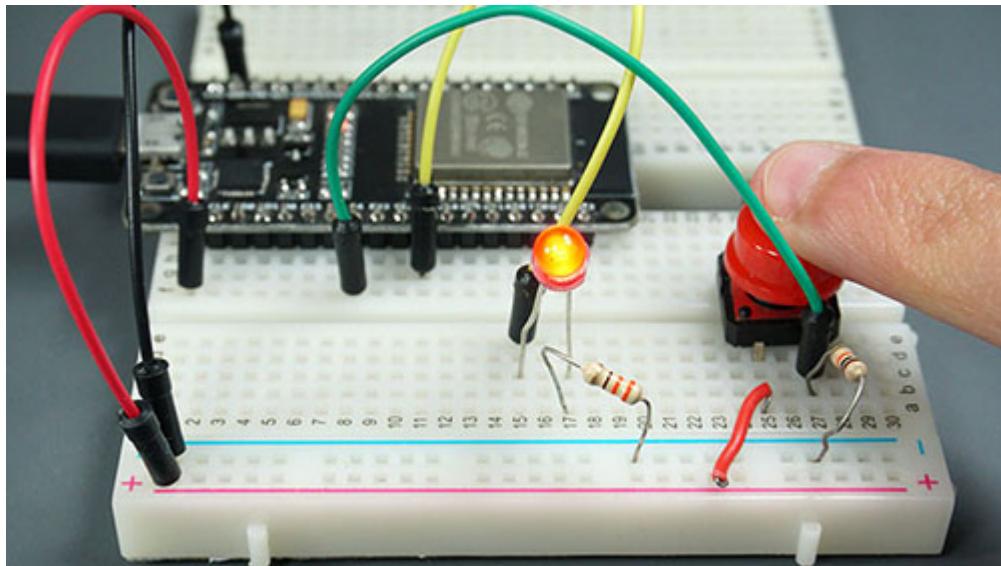
## Module #1: Getting Started with ESP32



This first Module is an introduction to the ESP32 board. We'll explore its features and show you how to use your board with this course. You'll also prepare your Arduino IDE to upload code to the ESP32. You must follow this Module first before proceeding to any other project/example in the eBook.

- **Unit 1:** Introducing ESP32
- **Unit 2:** Installing ESP32 in Arduino IDE
- **Unit 3:** How To Use Your ESP32 Board with this eBook

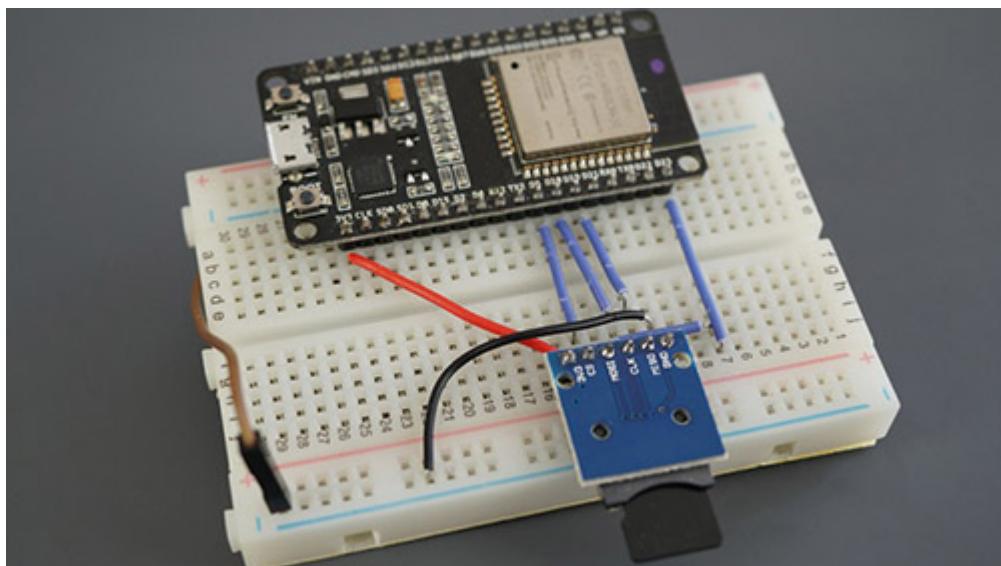
## Module #2: Exploring the ESP32 GPIO Pins



In this second Module, we'll explore the ESP32 GPIO functions. We'll show you how to control digital outputs, output PWM signals, and read digital and analog inputs. We'll also take a look at the ESP32 touch-capacitive pins and the ESP32 dual-core feature.

- **Unit 1:** Pinout Reference: ESP32 GPIOs Explained
- **Unit 2:** ESP32-S3 Pinout
- **Unit 3:** ESP32 Digital Inputs and Outputs
- **Unit 4:** Capacitive Touch Pins
- **Unit 5:** ESP32 Pulse-Width Modulation (PWM)
- **Unit 6:** Reading Analog Inputs
- **Unit 7:** ESP32 with PIR Motion Sensor: Interrupts and Timers
- **Unit 8:** ESP32 Dual Core: Create Tasks

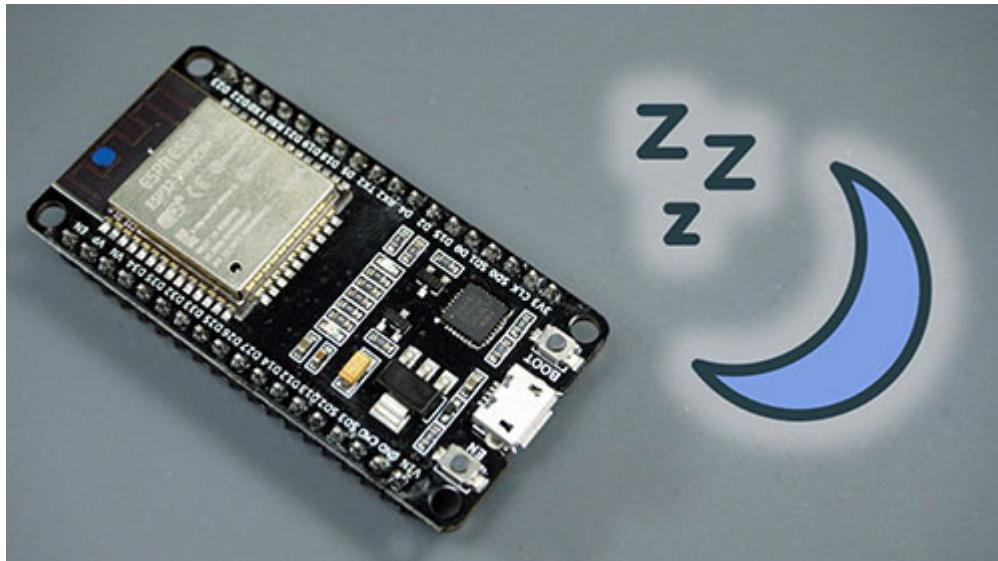
## Module# 3: Saving Data and Handling Files



Learn how to handle files on the ESP32 and how to save data permanently. We'll cover saving data on Preferences (NVS memory), on the ESP32 filesystem (LittleFS), and on a microSD card.

- **Unit 1:** Save Data Permanently using the Preferences Library
- **Unit 2:** ESP32 LittleFS Filesystem
- **Unit 3:** LittleFS: Save Variables Values in a File
- **Unit 4:** Saving Data to a microSD Card

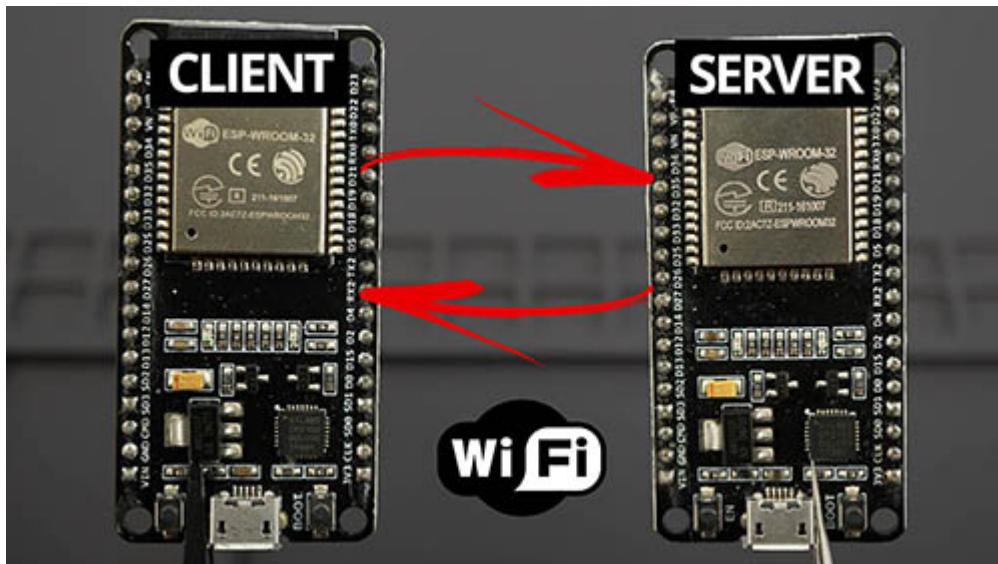
## Module #4: ESP32 Deep Sleep Mode



Using deep sleep with your ESP32 is a great way to save power in battery-powered applications. This module will show you how to put your ESP32 into deep sleep mode and the different ways to wake it up.

- **Unit 1:** ESP32 Deep Sleep Mode
- **Unit 2:** Deep Sleep – Timer Wake Up
- **Unit 3:** Deep Sleep with Touch Wake Up
- **Unit 4:** Deep Sleep External Wake Up

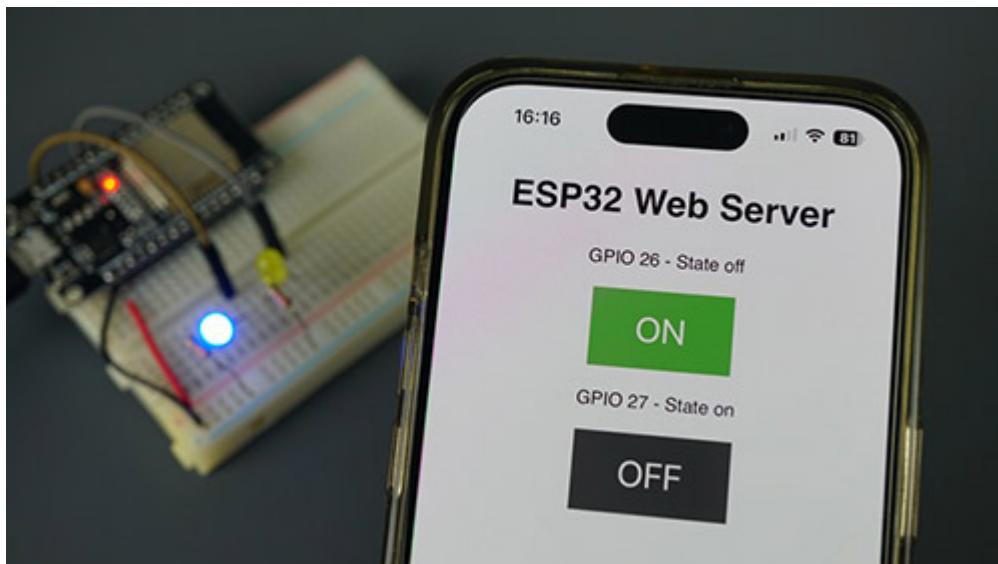
## Module #5: Introducing Wi-Fi



Get started with Wi-Fi on the ESP32. We'll cover basic concepts about Wi-Fi networks, you'll learn how to set the ESP32 as an access point and as a wi-fi station and how to make HTTP requests. We'll also cover how to set an ESP32 board as a Wi-Fi client and another one as a Wi-Fi server to exchange data between them.

- **Unit 1:** Introducing Wi-Fi
- **Unit 2:** Getting Started with HTTP Requests
- **Unit 3:** Making HTTP Requests (WorldTime API and ThingSpeak)
- **Unit 4:** ESP32 Client-Server Wi-Fi Communication Between Two Boards

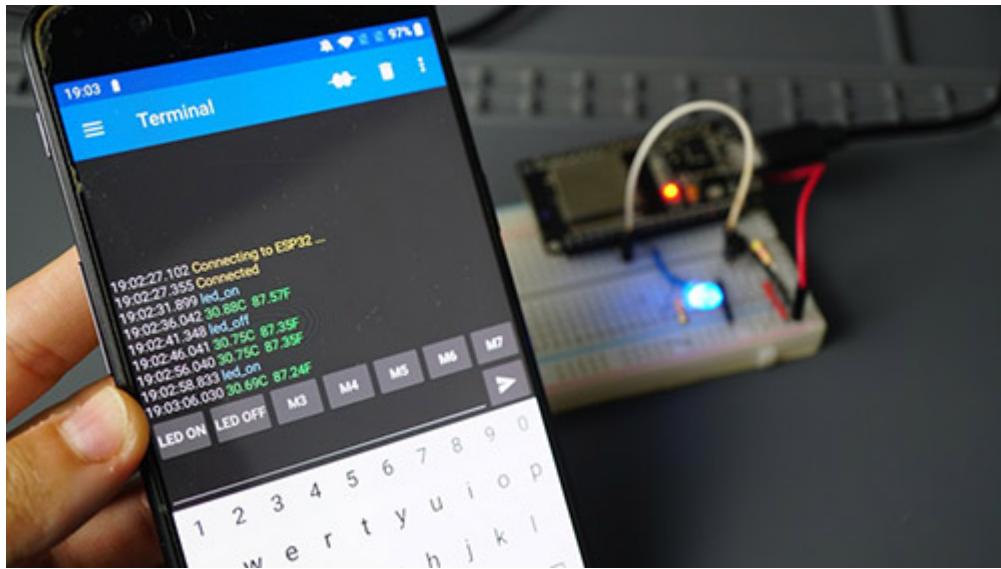
## Module #6: ESP32 Web Servers



This Module explains how to build several web servers with the ESP32. After explaining some theoretical concepts, you'll learn how to make a web server to display sensor readings, control outputs, and much more. You'll also learn how you can edit your web server interface using HTML and CSS.

- **Unit 1:** Web Server Introduction
- **Unit 2:** ESP32 Web Server: Control Outputs
- **Unit 3:** ESP32 Web Server: HTML and CSS Basics
- **Unit 4:** ESP32 Web Server: Authentication
- **Unit 5:** Accessing the ESP32 Web Server from Anywhere
- **Unit 6:** ESP32 Web Server – Display Sensor Readings
- **Unit 7:** Asynchronous Web Server: Temperature and Humidity Readings
- **Unit 8:** Asynchronous Web Server: Control Outputs
- **Unit 9:** Build an ESP32 Web Server using Files from Filesystem (LittleFS)

## Module #7: ESP32 Bluetooth Low Energy and Bluetooth Classic



The ESP32 comes not only with Wi-Fi but also Bluetooth and Bluetooth Low Energy built-in. Learn how to use the ESP32 Bluetooth functionalities to scan nearby devices and exchange information (BLE client and server).

- **Unit 1:** ESP32 Bluetooth Low Energy (BLE): Introduction
- **Unit 2:** Bluetooth Low Energy: BLE Server, Scanner, and Notify
- **Unit 3:** ESP32 BLE Server and Client – Part 1/2
- **Unit 4:** ESP32 BLE Server and Client – Part 2/2
- **Unit 5:** Bluetooth Classic

## Module #8: LoRa Technology with ESP32

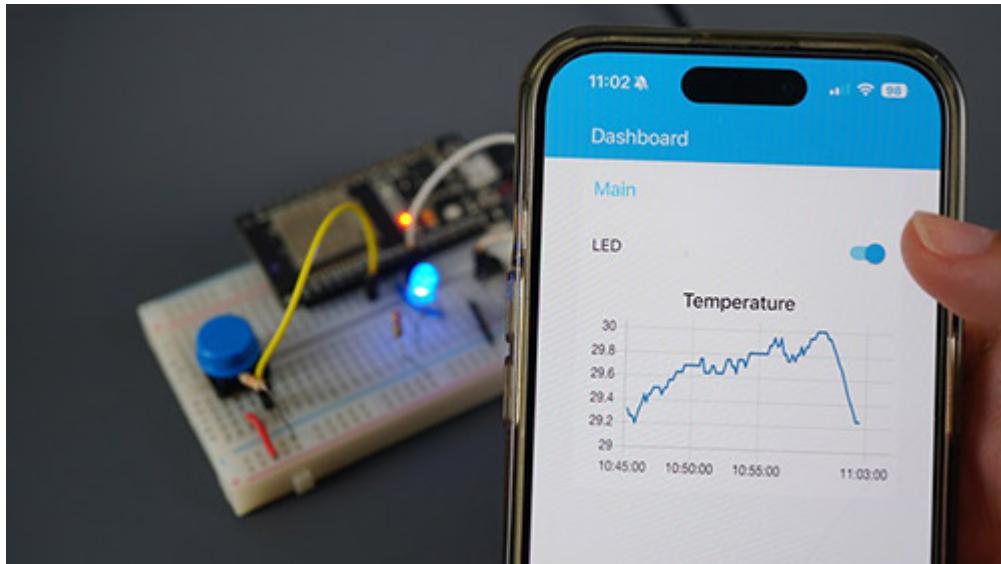


LoRa is a long-range wireless technology. In this Module, you'll explore LoRa and how you can use it with the ESP32 to extend the communication range between IoT devices.

- **Unit 1:** ESP32 with LoRa: Introduction
- **Unit 2:** ESP32 LoRa Sender and Receiver
- **Unit 3:** Further Reading about LoRa Gateways

- **Unit 4: LoRa: Where to Go Next?**

## Module #9: ESP32 with MQTT



MQTT stands for Message Queuing Telemetry Transport. It is a lightweight publish and subscribe system perfect for Internet of Things applications. In this Module, you'll learn how to use MQTT to establish a communication between two ESP32 boards and how you can control the ESP32 using Node-RED (an IoT platform).

- **Unit 1: Introducing MQTT**
- **Unit 2: Installing Mosquitto MQTT Broker on a Raspberry Pi**
- **Unit 3: MQTT Project: MQTT Client ESP32 #1**
- **Unit 4: MQTT Project : MQTT Client ESP32 #2**
- **Unit 5: Installing Node-RED and Node-RED Dashboard on a RPi**
- **Unit 6: Connect the ESP32 to Node-RED using MQTT**

## Module #10: ESP-NOW Communication Protocol



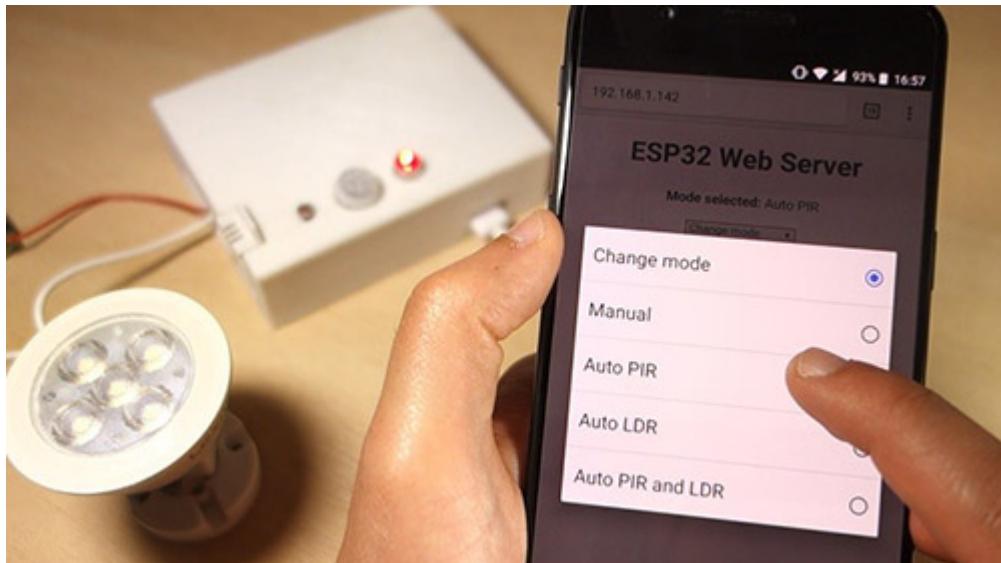
ESP-NOW is a connectionless communication protocol developed by Espressif that features short packet transmission. This protocol enables multiple devices to talk to each other easily.

- **Unit 1:** ESP-NOW: Getting Started
- **Unit 2:** ESP-NOW Two-Way Communication Between ESP32
- **Unit 3:** ESP-NOW Send Data to Multiple Boards (one-to-many)
- **Unit 4:** ESP-NOW Receive Data from Multiple Boards (many-to-one)
- **Unit 5:** ESP-NOW Web Server Sensor Dashboard (ESP-NOW + Wi-Fi)

## ESP32 Projects

The eBook also includes 4 extra advanced projects with the ESP32 applying the concepts learned throughout the course.

### Project #1: ESP32 Wi-Fi Multisensor – Temperature, Humidity, Motion, Luminosity, and Relay



In this project you'll build an ESP32 Wi-Fi Multisensor. This device consists of a PIR motion sensor, a light dependent resistor (LDR), a DHT22 temperature and humidity sensor, a relay, and a status RGB LED. You'll also build a web server that allows you to control the ESP32 multisensor using different modes.

- **Unit 1:** ESP32 Wi-Fi Multisensor – Temperature, Humidity, Motion, Luminosity, and Relay Control
- **Unit 2:** ESP32 Wi-Fi Multisensor – How the Code Works?

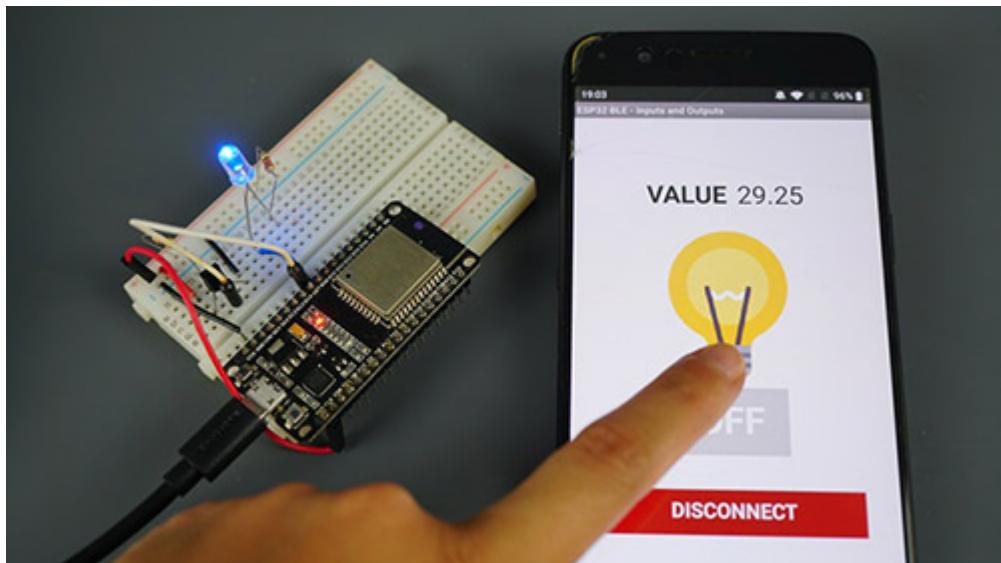
### Project #2: Remote Controlled Wi-Fi Car Robot



In this project we'll show you step by step how to create an ESP32 Wi-Fi remote controlled car robot.

- **Unit 1:** Remote Controlled Wi-Fi Car Robot – Part 1/2
- **Unit 2:** Remote Controlled Wi-Fi Car Robot – Part 2/2
- **Unit 3:** Assembling the Smart Robot Car Chassis Kit
- **Unit 4:** Extra – Access Point (AP) For Wi-Fi Car Robot

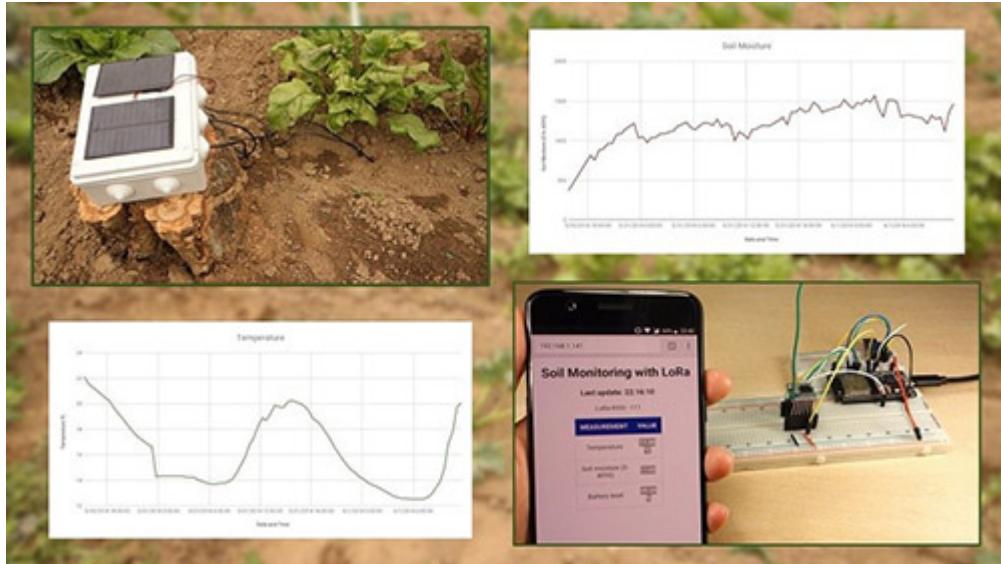
### Project #3: Bluetooth Low Energy (BLE) Android Application with MIT App Inventor – Control Outputs and Display Sensor Readings



In this project you're going to create an Android application to interact with the ESP32 using BLE.

- **Unit 1:** ESP32 BLE Android Application – Control Outputs and Display Sensor Readings
- **Unit 2:** Bluetooth Low Energy (BLE) Android Application with MIT App Inventor 2

## Project #4: LoRa Long Range Sensor Monitoring – Reporting Sensor Readings from Outside: Soil Moisture and Temperature



In this project you're going to build an off-the-grid monitoring system that sends soil moisture and temperature readings to an indoor receiver. To establish a communication between the sender and the receiver we'll be using LoRa communication protocol.

- **Unit 1:** LoRa Long Range Sensor Monitoring and Data Logging
- **Unit 2:** ESP32 LoRa Sender
- **Unit 3:** ESP32 LoRa Receiver
- **Unit 4:** ESP32 LoRa Sender Solar Powered
- **Unit 5:** Final Tests, Demonstration, and Data Analysis

## Recommended ESP32 Board

For this eBook, we'll be using the ESP32 DEVKIT V1 DOIT board. However, any other ESP32 with the ESP-WROOM-32 chip should work just fine.



Here's just a few examples of boards that are compatible:

**DOIT DEVKIT V1**



**ESP32 DevKit**



**ESP-32S NodeMCU**



**ESP32 Thing**



**WEMOS LOLIN32**



**"WeMos" OLED**



**HUZZAH32**



**Others**

(...)

## Invitation to Join our Private Forum!

This eBook comes with an opportunity to join our private Forum of like-minded people where you can ask questions about the eBook or other related subject. You'll get direct help from Rui and Sara or from other active members of the community.

[COURSES](#) [FORUM](#) [ACCOUNT](#) [BLOG](#) [LOGOUT](#)

## Q&A Forum

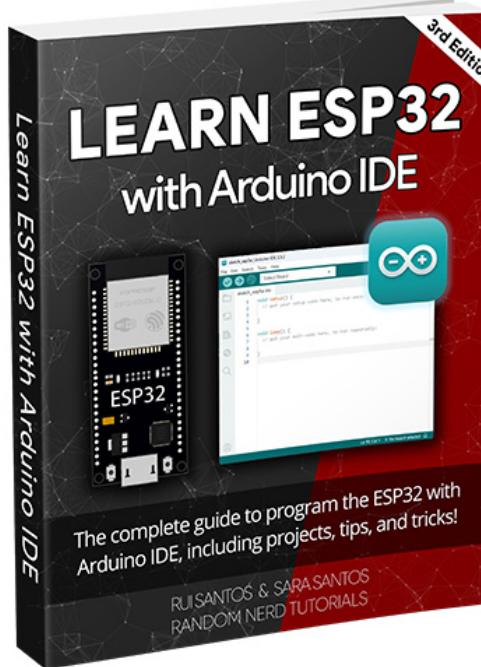
This is the Forum section! This is where you can ask questions about your projects and answer questions from other members. [Create new question.](#)

What do you want to know?  [Search](#)

Filter: All Open Resolved Closed Unanswered My questions My subscribes [Sort by](#)

	Rechargeable batteries for ESP32 projects <small>Answered</small> Stewart Lindenberge	58 views	1 answers	0 votes
	BLE Course, Is it possible that you explain in a project how to readout an eddystone beacon with the esp32 as client (Esp32 is not a beacon only a BLE Client) <small>Answered</small> Glef Scholten	37 views	1 answers	0 votes
	ESP32 Web Server <small>Answered</small> TekMason	154 views	3 answers	0 votes
	FIX for Invalid BLE Library in Arduino IDE using ESP32 <small>Answered</small> TekMason	284 views	4 answers	0 votes
	Updated ESP32 Devkit V1 Dolt Board <small>Answered</small> TekMason	239 views	4 answers	0 votes
	Google Home (Assistant) with Node-Red MQTT <small>Answered</small> TekMason	528 views	1 answers	0 votes
	RF Transmitter Solution <small>Answered</small> TekMason	97 views	1 answers	0 votes

## Download the eBook



- **3rd Edition – Updated January 28, 2025**
- All 10 Modules
- Downloadable PDF eBook with 810 pages
- 4 Advanced ESP32 Projects
- Code tested with ESP32 Arduino Core version 3.X
- Source Code + Full Schematics
- Unlimited Updates

- Exclusive access to a Private Forum

**GET THE EBOOK | \$37 USD**

[Click here to get the eBook | \\$37 USD](#)

**Note:** after your purchase, you receive an email with a username and password that you use to access the members' area and download the PDF eBook.

Have questions? Email me at <https://randomnerdtutorials.com/support> anytime for any reason.

You won't regret it. My 60 day money back guarantee backs up every word in this message. Proceed with confidence. See you inside,

– Rui Santos and Sara Santos