#### Modul 4

### **Input Output**

II2260 Sistem Embedded

Sekolah Teknik Elektro dan Informatika ITB



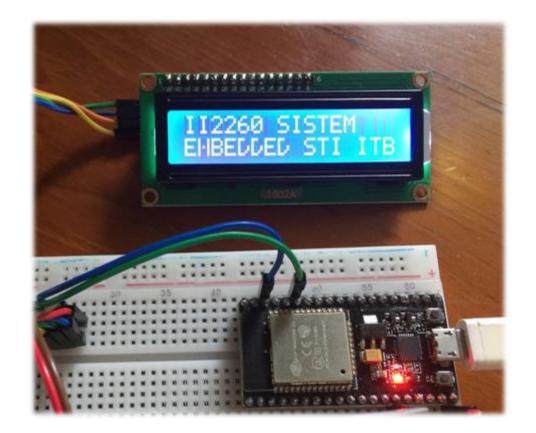


### Pembahasan

- 1. Microcontroller Input Output
- 2. ESP32 General Purpose I/O
- 3. Simple I/O project







Sekolah Teknik Elektro dan Informatika ITB

### **Modul 4. Input Output**

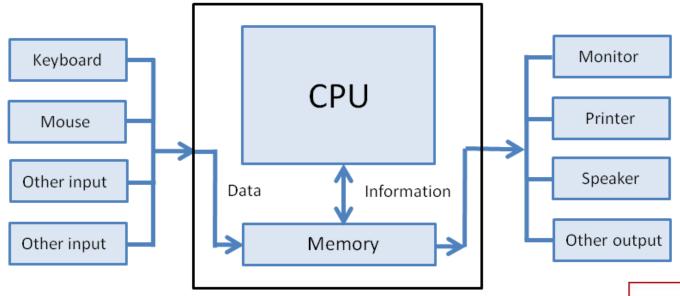
### 4.1. Microcontroller's I/O

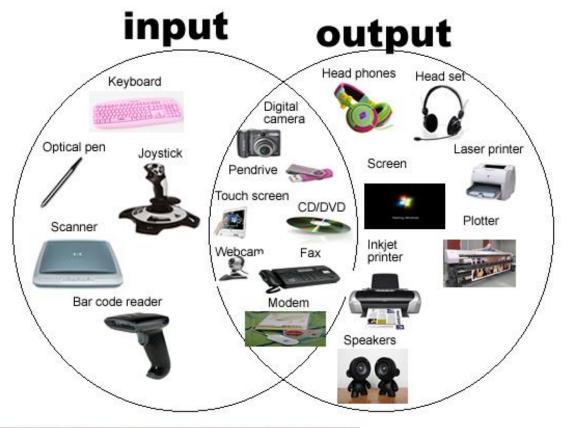
II2260 Sistem Embedded

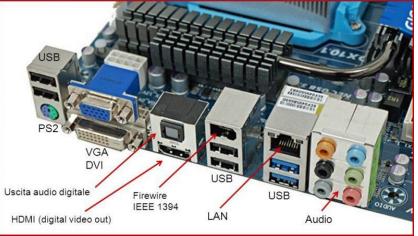




**Computer Systems I/O** 



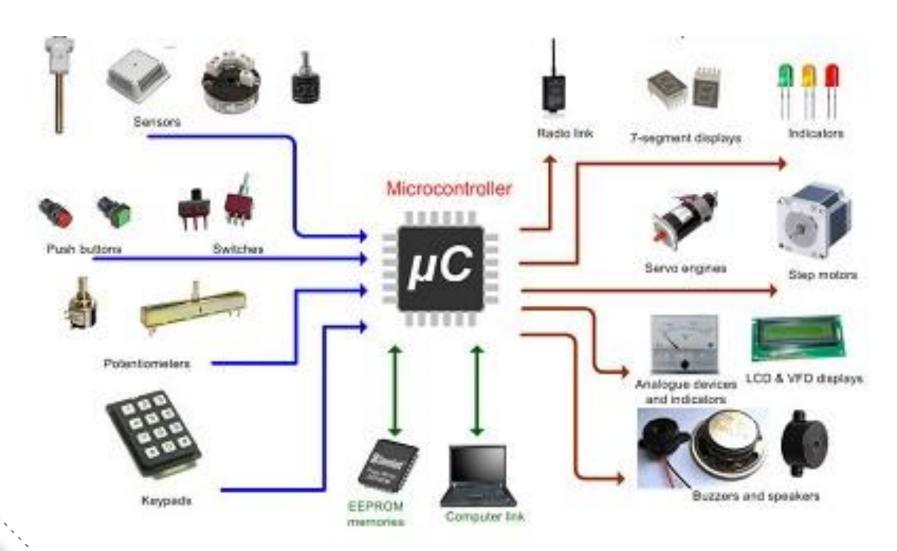








## Microcontroller I/O

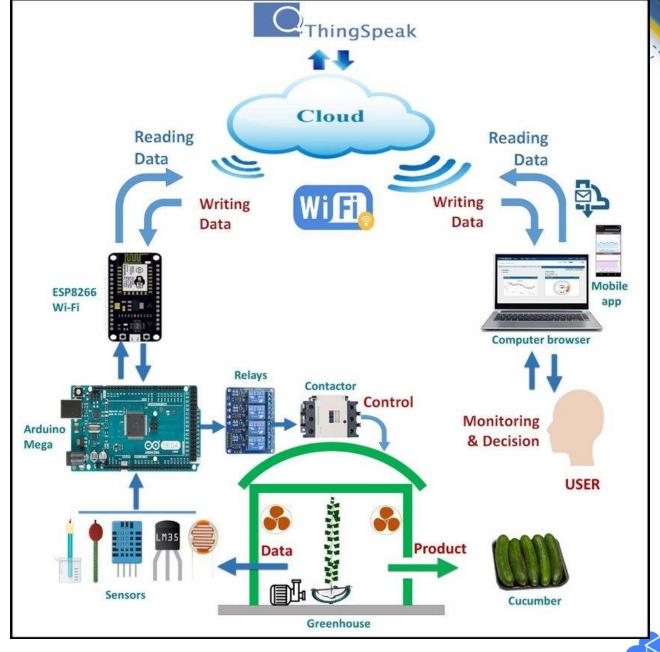






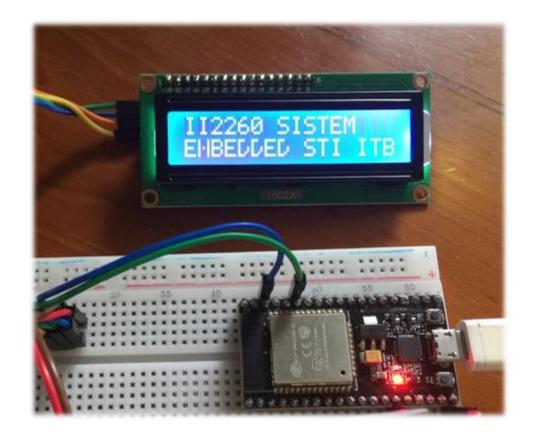
### Mikrokontroler untuk Monitoring and Kendali

**Green House** 









Sekolah Teknik Elektro dan Informatika ITB

**Modul 4. Input Output** 

4.2. **ESP32 GPIO** 

II2260 Sistem Embedded



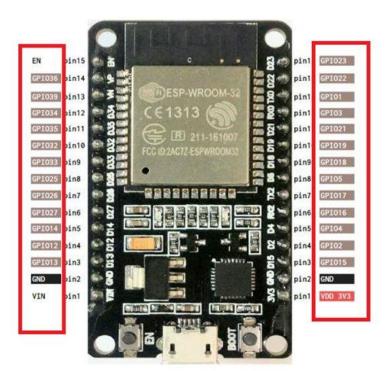


### ESP32 GPIO

ESP32 memiliki pin Input dan Output sebagai antarmuka untuk berkomunikasi dengan dunia luar. Pin ini disebut sebagai General Purpose Input Output (GPIO).

Antarmuka Input Output pada ESP32, terdiri dari:

- 1. 18 buah kanal Analog-to-Digital Converter (ADC)
- 2. 3 buah antarmuka Serial-Parallel Interface (SPI)
- 3 buah antarmuka UART
- 4. 2 buah antarmuka I2C
- 5. 16 kanal output PWM
- 6. 2 Digital-to-Analog Converter (DAC)
- 7. 2 buah antarmuka I2S
- 8. 10 buah GPIO Capacitive Sensing

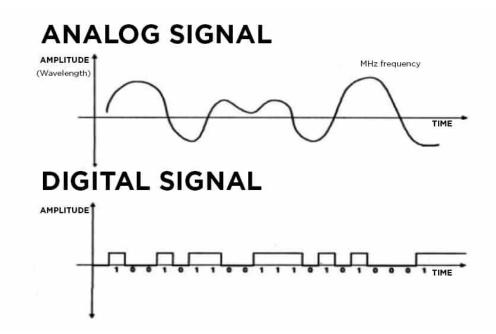






### Digital and Analog I/O

- GPIO dapat digunakan untuk menerima sinyal input digital atau analog, dan juga mengeluarkan sinyal output digital atau analog.
- Pada sinyal digital berarti hanya ada dua kondisi, yaitu OFF (0 Volt) dan ON (3,3 Volt).
- Sinyal analog memiliki besaran yang bukan hanya ON dan OFF saja, tetapi ada nilai lain di antara kondisi OFF (0 Volt) dan ON (3,3 Volt).
  - Sebagai contoh output analog adalah untuk meredupkan lampu.



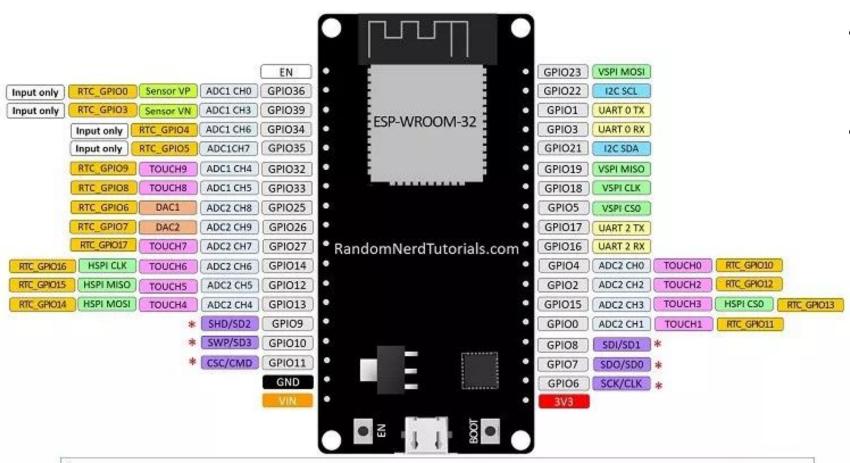




### ESP32 DevKit DOIT (36 pin)

#### **ESP32 DEVKIT V1 - DOIT**

version with 36 GPIOs



\* Pins SCK/CLK, SDO/SD0, SDI/SD1, SHD/SD2, SWP/SD3 and SCS/CMD, namely, GPIO6 to GPIO11 are connected to the

integrated SPI flash integrated on ESP-WROOM-32 and are not recommended for other uses.

- Pada ESP32, walaupun setiap pin dapat dipertukarkan, tetapi terdapat pin default.
- Terdapat pin yang cocok digunakan untuk keperluan tertentu, pin mana yang baik digunakan untuk input, dan mana yang baik digunakan untuk output, serta dapat digunakan dengan kondisi persyaratan tertentu.

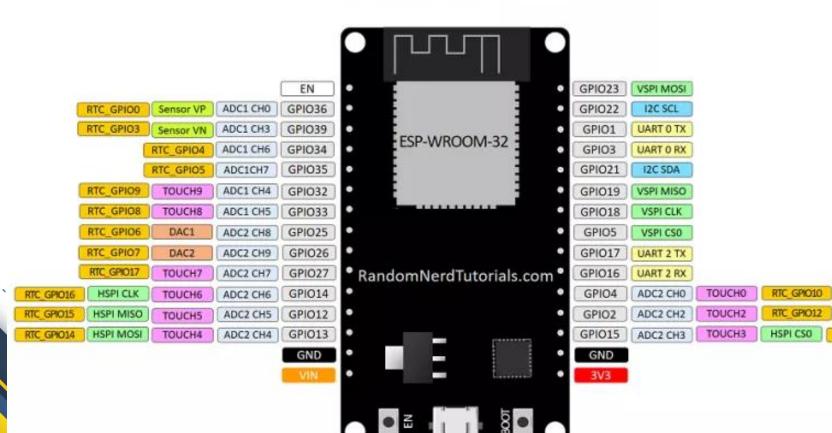




### ESP32 DevKit DOIT (30 pin)

#### **ESP32 DEVKIT V1 - DOIT**

version with 30 GPIOs



- 18 Analog-to-Digital Converter (ADC) channels
- 3 SPI interfaces
- 3 UART interfaces
- 2 I2C interfaces
- 16 PWM output channels
- 2 Digital-to-Analog Converters (DAC)
- 2 I2S interfaces
- 10 Capacitive sensing GPIOs





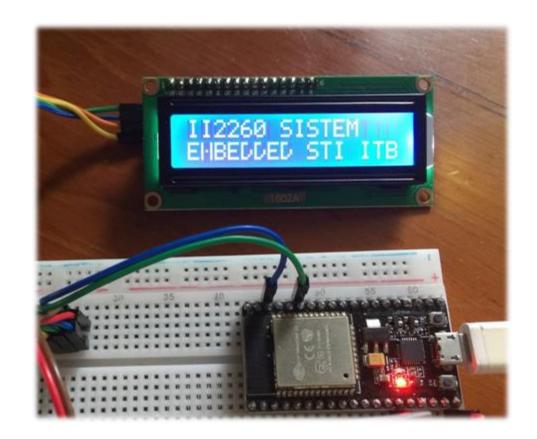
### ESP-32S NodeMCU (38 pin)

#### ESP32 Dev Board PINMAP

					3.3V	1	1 6	CHANN.	e Con		A	GND						
(pu)				RESET	EN	2	3		$\mathcal{W}_{oxed{L}_{i}}$		•0	GPIO23	VSPI MOSI					SPI MOSI
SVP			ADC0		GPIO36	age S	4	ş				<b>GPI022</b>						Wire SCL
SVN			ADC3		GPIO39	¥.		8				GPI01	TX0					Serial TX
			ADC6		GPIO34	3	괴목	a de la composición della comp	THE REAL PROPERTY.		1	GPI03	RX0					Serial RX
			ADC7		GPIO35	035	4			4	1	GPIO21						Wire SDA
		тоисня	ADC4		GPIO32	8	76			- 14	-	GND						
		TOUCHS	ADC5		GPIO33	E		or the	ALTE:	ě	4	GPIO19	VSPI MISO					SPI MISO
DAC1			ADC18		GPIO25	08		23 /		02 8		GPIO18	VSPI SCK					SPI SCK
DAC2			ADC19		GPIO26	926		10 m	112		t i	GPI05	VSPI SS				(pu)	SPI SS
		TOUCH7	ADC17		GPIO27	. 037		ತದ	0.0	82.5	-	GPI017						
	TMS	TOUCH6	ADC16	HSPI SCK	GPIO14	• 8						GPIO16				4		
(pd)	TDI	TOUCH5	ADC15	HSPI MISO	GPIO12	8		468				GPIO4		ADC10	TOUCH0		(pd)	
					GND	68	01 [	38	[2]	ĮU ş	<b>!</b> *-	GPI00	BOOT	ADC11	TOUCH1		(pu)	
	TCK	TOUCH4	ADC14	HSPI MOSI	GPIO13	설심			1	i i		GPI02	i.	ADC12	TOUCH2		(pd)	
				FLASH D2	GPI09	\$02	01		• #:U	T	1	GPI015	HSPI SS	ADC13	тоиснз	TDO	(pu)	
				FLASH D3	<b>GPI010</b>	. 65 Se	L.	ALC:		11 R3	4	GPI08	FLASH D1					
				FLASH CMD	GPIO11	8	0	1	4	0	<b>3</b> 6	GPI07	FLASH DO					
					SV	( 9)	P.			1 446	\$ 100	GP106	FLASH SCK					







Sekolah Teknik Elektro dan Informatika ITB

**Modul 4. Input Output** 

4.3. Simple I/O Project

II2260 Sistem Embedded



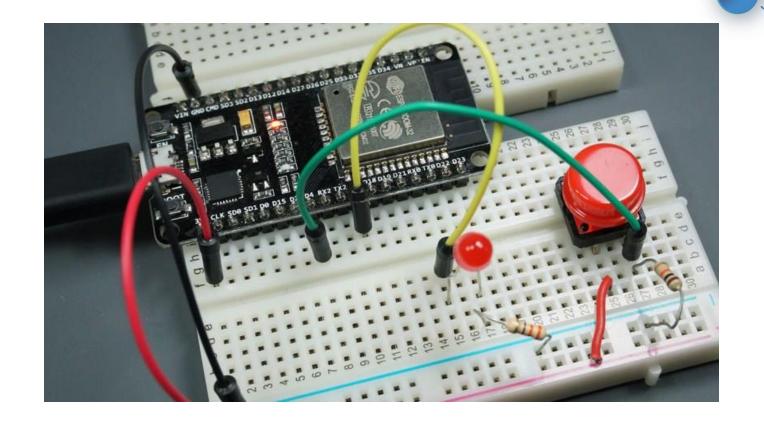


### Deskripsi Project: Simple I/O

Read digital input
 (push button switch) to
 control digital output
 (LED)

 Referensi:

 https://randomnerdtutorials
 .com/esp32-digital-inputsoutputs-arduino/







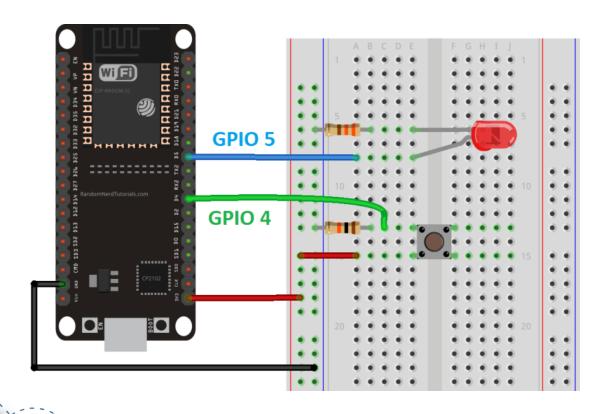
### Komponen Yang Dibutuhkan

- ESP32
- LED
- Resistor 330 ohm
- Push button
- Resistor 10k ohm
- Breadboard
- Jumper wires





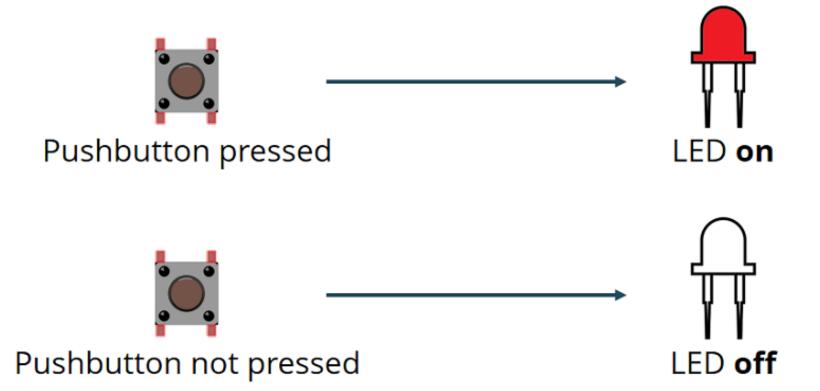
### Gambar Rangkaian/ Diagram Skematik







### **Scenario**







### **Codes (Setup Part)**

```
// Complete Instructions: https://RandomNerdTutorials.com/esp32-digital-inputs-outputs
// set pin numbers
const int buttonPin = 4; // the number of the pushbutton pin
const int ledPin = 5; // the number of the LED pin
// variable for storing the pushbutton status
int buttonState = 0;
void setup() {
  Serial.begin(115200);
  // initialize the pushbutton pin as an input
  pinMode(buttonPin, INPUT);
  // initialize the LED pin as an output
  pinMode(ledPin, OUTPUT);
```



### **Codes (Loop Part)**

```
void loop() {
  // read the state of the pushbutton value
  buttonState = digitalRead(buttonPin);
  Serial.println(buttonState);
  // check if the pushbutton is pressed.
  // if it is, the buttonState is HIGH
  if (buttonState == HIGH) {
    // turn LED on
    digitalWrite(ledPin, HIGH);
  } else {
    // turn LED off
    digitalWrite(ledPin, LOW);
```

# **Hasil Eksperimen**

