# Electronic Circuits Labs

Module presentation

#### |Syllabus

This course aims to equip beginners with basic functional knowledge of the Arduino microcontroller|Raspberry Pi nanocomputer through a practical approach. Students can expect to learn how to write and upload simple code, integrate various physical inputs and outputs, and build low-cost, low-power systems.

#### Prerequisite

- DSA 1
- Introduction to Linux

## The pedagogical team



Dr. Bensalem



Dr. Djouama

#### Topics to be covered

LEDs [Arduino]

Proximity Sensor [Arduino]

Proximity Sensor | Servomotor | LCD | LED [Arduino]

Proximity Sensor | Servomotor | LCD | LED [Raspberry Pi]

Sensors | Webservers [Raspberry Pi]

[More details in the module's website]

#### Definition of IoT

Definition: IoT refers to the network of interconnected physical devices, vehicles, buildings, and other items embedded with sensors, software, and network connectivity, enabling them to collect and exchange data.



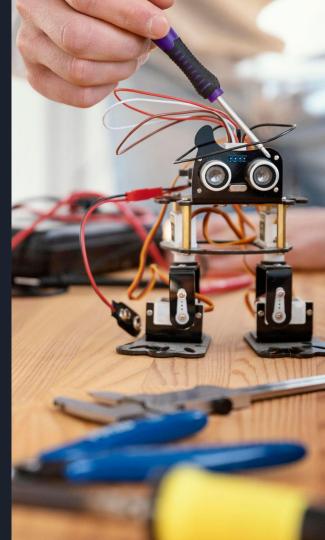
#### Key Components of IoT

Sensors and Actuators: Devices that collect and transmit data.

Connectivity: Networks facilitating communication (Wi-Fi, Bluetooth, RFID).

Data Processing: Cloud platforms and edge computing for data analysis.

User Interface: Interfaces for users to interact with IoT devices.



#### Applications of IoT

Smart Homes: Home automation for security, energy efficiency, and convenience.

Industrial IoT (IIoT): Monitoring and optimizing industrial processes.

Healthcare: Remote patient monitoring, smart medical devices.

Smart Cities: Infrastructure management, traffic optimization, waste management.

Agriculture: Precision farming, monitoring crop conditions.



#### Challenges and Concerns

Security: Risks of unauthorized access and data breaches.

Privacy: Collection and use of personal data.

Interoperability: Compatibility issues between different IoT devices.

Scalability: Managing the increasing number of connected devices.



#### Future Trends

5G/6G Integration: Faster and more reliable connectivity.

Artificial Intelligence: Enhancing IoT capabilities through intelligent algorithms.

Edge Computing: Processing data closer to the source for reduced latency.

Blockchain: Ensuring secure and transparent transactions in IoT.

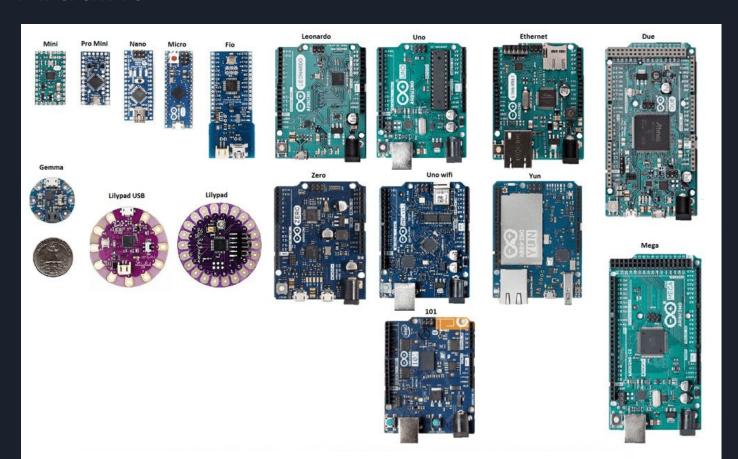


#### Devices

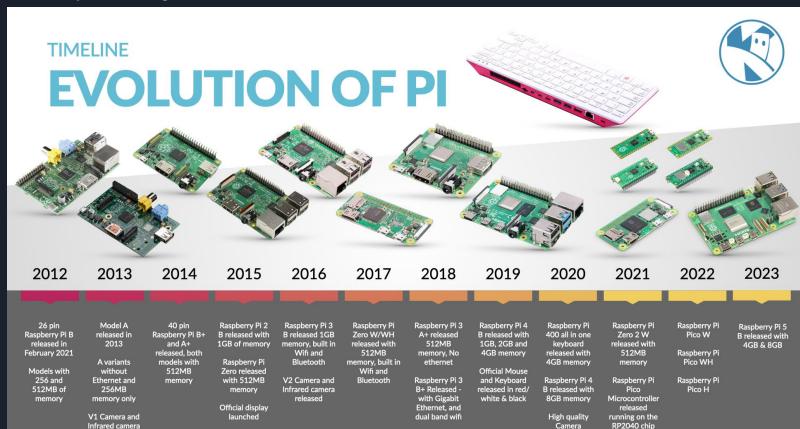




### Arduino



#### Raspberry Pi



## Components [input]







#### Components [Ultrasonic sensor]

An ultrasonic sensor (HC-SR04) is an instrument that measures the distance to an object using ultrasonic sound waves.

Provides 2cm to 400cm of non-contact measurement functionality

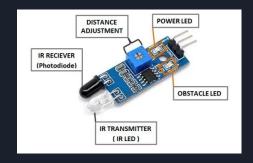




## Components [Infrared Obstacle Avoidance sensor]

An Infrared Obstacle Sensor Module has a built-in IR transmitter and IR receiver that sends out IR energy and looks for reflected IR energy to detect the presence of any obstacle in front of the sensor module.

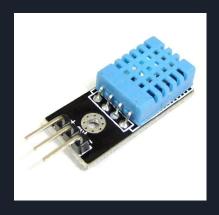
The module has an onboard potentiometer that lets users adjust the detection range.

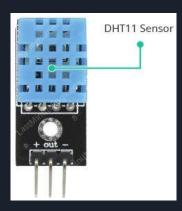




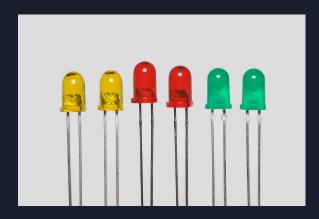
#### Components [Temperature & Humidity sensor]

DHT11 can measure temperature from  $0^{\circ}$ C to  $50^{\circ}$ C with a  $\pm 2.0^{\circ}$ C accuracy, and humidity from 20 to 80% with a 5% accuracy.





LED | LED RGB





16 x 2 LCD (Liquid Crystal Display)



#### **DC Motor**

A DC motor is an electrical motor that uses direct current (DC) to produce mechanical force. The most common types rely on magnetic forces produced by currents in the coils.





Servo motor

A servo motor is a type of motor that can rotate with great precision.





#### Stepper motor

Stepper motors use a cogged wheel and electromagnets to rotate the wheel round, a 'step' at a time.



