

# MODULE 1 — Basics of IoT

## 1. Definition of IoT

The **Internet of Things (IoT)** refers to a network of physical devices embedded with sensors, software and connectivity that allows them to **collect and exchange data through the internet**.

These devices communicate with each other and cloud systems to automate tasks and improve decision making.

Examples:

- Smart homes
  - Smart cities
  - Wearable health devices
  - Industrial automation
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## 2. How IoT Works

According to the PPT, a typical IoT system has **three components**:

### Smart Devices

Devices such as sensors, cameras, smart TVs or machines that collect data.

### IoT Application

Software that processes and analyzes data using technologies like **AI and machine learning**.

### Graphical User Interface (GUI)

Users interact with the IoT system through apps or dashboards.

Example:

Smart home mobile apps controlling lights and temperature.

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## 3. IoT Technologies

The PPT identifies major technologies driving IoT:

### Cloud Computing

Stores and manages IoT data remotely.

### Edge Computing

Processes data close to devices to reduce delay.

### Machine Learning

Analyzes IoT data and makes intelligent decisions.

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## 4. Parts of IoT

From the class PPT:

### Sensors

Devices that detect environmental changes.

Examples:

- temperature sensor
- pressure sensor
- humidity sensor

### Actuators

Devices that perform actions based on commands.

Examples:

- motors
- valves
- pumps

### Communication Devices

Hardware used to transmit data such as WiFi modules or Zigbee hubs.

Your class notes also mention **transducers converting physical signals to electrical signals**.

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## 5. Types of Sensors

From class notes:

### Photoelectric Sensors

Convert light energy into electrical energy.

### Thermoelectric Sensors

Convert temperature changes into electrical signals.

### Electrochemical Sensors

Convert chemical reactions into electrical signals.

Sensors may also be classified as:

- Analog sensors
  - Digital sensors
  - Active sensors
  - Passive sensors
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## 6. 7 Layers of IoT Architecture

Your notes and PPT both describe the **seven layer architecture**.

### 1 Physical Layer

Contains sensors and physical devices.

### 2 Data Link Layer

Handles communication within local networks.

### 3 Network Layer

Routes data across different networks.

### 4 Transport Layer

Ensures reliable transmission of data.

### 5 Session Layer

Maintains communication sessions.

### 6 Presentation Layer

Formats and encrypts data.

### 7 Application Layer

Provides user interface and applications.

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## 7. Industry 4.0

Industry 4.0 refers to the **fourth industrial revolution**, where manufacturing integrates digital technologies such as IoT, AI and data analytics.

### Industrial Revolutions

- ① First revolution  
Steam power and mechanization.
  - ② Second revolution  
Electricity and assembly lines.
  - ③ Third revolution  
Computers and automation.
  - ④ Fourth revolution  
Smart factories using IoT and AI.
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## 8. DNA of IoT

Your handwritten notes emphasize this concept.

DNA of IoT consists of three components:

### **D – Devices**

Sensors and hardware components.

### **N – Networks**

Communication networks such as WiFi, Zigbee and 5G.

### **A – Applications**

Software systems, dashboards and analytics.

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## 9. Four Pillars of IoT

The PPT identifies four pillars supporting IoT systems.

### **M2M (Machine-to-Machine)**

Direct communication between devices.

Example:

Sensors sending temperature data to servers.

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### **RFID (Radio Frequency Identification)**

Used to identify and track objects using radio waves.

Example:

Inventory tracking in warehouses.

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### **WSN (Wireless Sensor Networks)**

Networks of distributed sensors collecting environmental data.

Example:  
Agriculture monitoring.

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## **SCADA**

Supervisory Control and Data Acquisition systems used for industrial control.

Example:  
Power plant monitoring systems.

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# **10. IoT Advantages**

From your notes:

- Accelerates innovation
  - Provides real-time data
  - Extracts insights from data
  - Improves productivity
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# **11. Challenges in IoT**

## **Interoperability**

Different devices must work together.

## **Scalability**

Large numbers of devices must be supported.

## **Reliability**

System failures must be minimized.

## **Power Consumption**

Devices often operate on batteries.

## **Security**

Protection from cyber attacks.

Your notes specifically mention **privacy and data security risks**.

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# **12. IoT Hardware Platforms**

Important hardware mentioned in class notes:

## **Arduino Uno**

Microcontroller board used for sensor projects.

## **Raspberry Pi**

Single-board computer capable of running operating systems.

## **BeagleBoard**

Advanced single-board computer with higher processing capability.