



INTERNET OF THINGS

ARDUINO . RASPBERRY PI . ESP32 . LORAWAN . CLOUD DASH . INDUSTRIAL IOT . EDGE AI . T

DURATION

350 Hours

LEVEL

**Beginner to
Advanced**

MODULES

15

MODE

**Classroom •
Online • Hybrid**

01 COURSE OVERVIEW

A hardware-first IoT programme running from basic electronics to cloud-connected industrial deployments.

Learners work on real boards throughout: Arduino, Raspberry Pi and ESP32, with sensors, relays and motors. The programme covers embedded programming, communication protocols, cloud platforms, smart home and industrial automation, device security, edge AI with TinyML, mobile app integration and IoT data analytics.

Each module ends in a working build, and the final 45 hours are given to industry projects such as smart agriculture monitoring, machine health monitoring and energy metering.

WHO IT IS FOR

ECE, EEE and mechatronics students and graduates

Embedded developers moving to connected products

Automation and maintenance engineers

Product teams prototyping hardware

PREREQUISITES

Basic electronics and programming fundamentals. C or Python exposure is helpful; both are revised in the programme.

02 LEARNING OUTCOMES

01 Read a circuit, wire sensors and actuators, and measure with a multimeter.

03 Select and implement the right protocol — MQTT, BLE, LoRaWAN, Modbus.

05 Build cloud dashboards with alerts and remote device control.

07 Secure devices with authentication, TLS and safe firmware practice.

09 Analyse sensor time-series data and build predictive monitoring.

02 Program Arduino, ESP32 and Raspberry Pi boards for sensing and control.

04 Connect devices to AWS IoT Core, Azure IoT Hub, ThingsBoard or Blynk.

06 Deliver smart home and industrial monitoring systems end to end.

08 Deploy TinyML models on device for vision and voice recognition.

03 MODULE STRUCTURE

15 MODULES

01 INTRODUCTION TO INTERNET OF THINGS (IOT)

10 HOURS

Introduction to IoT

IoT Architecture

IoT Communication Models

Industry 4.0

Smart Agriculture

IoT Challenges

History and Evolution of IoT

IoT Ecosystem

IoT Applications

Smart Cities

Smart Healthcare

IoT Security Fundamentals

PRACTICAL

SETTING UP THE IOT DEVELOPMENT ENVIRONMENT

INSTALLING ARDUINO IDE AND VISUAL STUDIO CODE

CONFIGURING DEVELOPMENT BOARDS

02 ELECTRONICS FUNDAMENTALS

20 HOURS

Basic Electronics

Ohm's Law

Digital vs Analog Signals

Relays

LEDs

Batteries and Power Supplies

Voltage, Current, Resistance

Breadboard and Circuit Design

Sensors and Actuators

Motors

Switches

Multimeter Usage

PRACTICAL

LED BLINKING

SENSOR INTERFACING

RELAY CONTROL

03 PROGRAMMING FOR IOT

20 HOURS

C/C++ Programming Basics

Loops

Arrays

Variables

Functions

LIBRARIES

OBJECT-ORIENTED PROGRAMMING BASICS

SERIAL COMMUNICATION

INTERRUPTS

TIMERS

PRACTICAL

ARDUINO PROGRAMMING

SERIAL MONITOR PROJECTS

04 ARDUINO PROGRAMMING

35 HOURS

Arduino Architecture

Nano

Digital I/O

PWM

SPI

Sensor Integration

Servo Motors

Relay Modules

Arduino UNO

Mega

Analog Inputs

UART

I2C Communication

LCD Displays

Stepper Motors

SENSORS COVERED

TEMPERATURE SENSOR

HUMIDITY SENSOR

LDR

IR SENSOR

ULTRASONIC SENSOR

PIR MOTION SENSOR

GAS SENSOR

SOIL MOISTURE SENSOR

RAIN SENSOR

PRACTICAL

SMART LIGHTING

SMART IRRIGATION

AUTOMATIC WATER LEVEL CONTROLLER

HOME SECURITY ALARM

05 RASPBERRY PI

30 HOURS

Raspberry Pi Hardware

Linux Basics

Python Programming

USB Devices

SSH

Raspberry Pi OS

GPIO Programming

Camera Module

Wi-Fi & Bluetooth

Remote Access

PRACTICAL

HOME AUTOMATION SERVER

CCTV MONITORING

TEMPERATURE MONITORING SYSTEM

06 ESP32 PROGRAMMING

30 HOURS

ESP32 Architecture

Bluetooth Low Energy (BLE)

ADC

PWM

OTA Firmware Updates

Wi-Fi Communication

GPIO

DAC

Deep Sleep

MQTT Client Programming

PRACTICAL

WI-FI SENSOR NODE

SMART ENERGY METER

BLUETOOTH AUTOMATION

07 IOT COMMUNICATION PROTOCOLS

20 HOURS

MQTT

WebSocket

Modbus

LoRaWAN

Wi-Fi

RFID

HTTP/HTTPS

CoAP

Zigbee

Bluetooth Low Energy (BLE)

NFC

PRACTICAL

MQTT BROKER SETUP

IOT MESSAGING

DEVICE COMMUNICATION

08 IOT CLOUD PLATFORMS

25 HOURS

Cloud Computing Basics

Device Registration

Cloud Storage

Device Monitoring

Notifications

IoT Cloud Architecture

Data Streaming

Dashboards

Alerts

PLATFORMS

AWS IOT CORE

MICROSOFT AZURE IOT HUB

GOOGLE CLOUD IOT SERVICES

THINGSBOARD

BLYNK

THINGSPEAK

PRACTICAL

CONNECT ESP32 TO CLOUD

REAL-TIME SENSOR DASHBOARD

REMOTE DEVICE CONTROL

09 SMART HOME AUTOMATION

20 HOURS

Smart Home Architecture

Voice Assistants

Smart Door Lock

Smart Energy Management

Home Automation Protocols

Smart Lighting

Smart Appliances

Smart Security Systems

PRACTICAL

WI-FI HOME AUTOMATION

VOICE-CONTROLLED HOME AUTOMATION

MOBILE APP-CONTROLLED DEVICES

10 INDUSTRIAL INTERNET OF THINGS (IIOT)

25 HOURS

Industry 4.0

PLC Basics

Industrial Communication Protocols

Machine Monitoring

Edge Computing

Industrial Sensors

SCADA Introduction

Predictive Maintenance

Industrial Automation

PRACTICAL

MACHINE HEALTH MONITORING

PREDICTIVE MAINTENANCE DASHBOARD

INDUSTRIAL DATA ACQUISITION

11 IOT SECURITY

20 HOURS

IoT Threat Landscape

Device Authentication

SSL/TLS

Firmware Security

IoT Risk Assessment

Secure Boot

Encryption

Secure MQTT

Access Control

Secure Device Management

PRACTICAL

SECURE DEVICE COMMUNICATION

MQTT AUTHENTICATION

SSL CONFIGURATION

12 EDGE AI & TINYML

20 HOURS

Introduction to TinyML

TensorFlow Lite

On-Device AI

Voice Recognition

Edge Computing

TinyML Workflow

Image Recognition

Predictive Analytics at the Edge

PRACTICAL

TINYML MODEL DEPLOYMENT

AI-BASED OBJECT DETECTION

VOICE COMMAND RECOGNITION

13 MOBILE APP INTEGRATION

15 HOURS

IoT Mobile Applications

MIT App Inventor

REST APIs

Blynk

Flutter Basics

Push Notifications

PRACTICAL

DEVELOP MOBILE DASHBOARD

MOBILE DEVICE CONTROL

14 IOT DATA ANALYTICS

15 HOURS

Sensor Data Collection

Time-Series Analysis

AI-Based Insights

Data Visualization

Dashboard Design

Alert Systems

PRACTICAL

IOT ANALYTICS DASHBOARD

PREDICTIVE MONITORING

15 CAPSTONE PROJECTS

45 HOURS

INDUSTRY PROJECTS

SMART HOME AUTOMATION SYSTEM

SMART AGRICULTURE MONITORING

SMART IRRIGATION CONTROLLER

IOT-BASED WEATHER STATION

SMART PARKING SYSTEM

SMART STREET LIGHTING

SMART ENERGY METER

INDUSTRIAL MACHINE MONITORING

SMART WATER QUALITY MONITORING

SMART HEALTHCARE MONITORING

ASSET TRACKING SYSTEM

SMART ATTENDANCE SYSTEM (RFID/FACE RECOGNITION)

COLD CHAIN TEMPERATURE MONITORING

AI-BASED SMART SECURITY SYSTEM

04 TOOLS & TECHNOLOGIES COVERED

HARDWARE

ARDUINO UNO

ARDUINO NANO

ARDUINO MEGA

RASPBERRY PI

ESP32

ESP8266

NODEMCU

PROGRAMMING LANGUAGES

C

C++

PYTHON

MICROPYTHON

COMMUNICATION PROTOCOLS

MQTT

HTTP/HTTPS

BLE

ZIGBEE

LORAWAN

MODBUS

WI-FI

RFID

NFC

CLOUD PLATFORMS

AWS IOT CORE

MICROSOFT AZURE IOT HUB

GOOGLE CLOUD IOT

BLINK

THINGSPEAK

THINGSBOARD

DEVELOPMENT TOOLS

ARDUINO IDE

PLATFORMIO

VISUAL STUDIO CODE

RASPBERRY PI OS

MQTT EXPLORER

NODE-RED

AI & ANALYTICS

TENSORFLOW LITE

TINYML

GRAFANA

INFLUXDB

PYTHON

OPENCV (OPTIONAL FOR VISION PROJECTS)

05 ASSESSMENT & CERTIFICATION

Module assignments and labs	25%
Mini projects	20%
Internal assessments	15%
Capstone project and review	40%

CERTIFICATION

Learners who complete all modules, submit the capstone project and clear the final review receive a course completion certificate from Kaizen Infinities Private Limited. Project work is documented for the learner's portfolio and GitHub profile, and interview preparation is included in the final week.

06 CAREER OUTCOMES

ROLES THIS PROGRAMME PREPARES FOR

IOT ENGINEER

EMBEDDED SYSTEMS ENGINEER

IOT SOLUTION ARCHITECT

INDUSTRIAL AUTOMATION ENGINEER

FIRMWARE DEVELOPER

EDGE AI ENGINEER

IOT SUPPORT ENGINEER

HARDWARE PROTOTYPING ENGINEER

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