

Course Name**Internet of Things****Course Objective**

1. To make the learner identify potential zones of uses of IoT in Industry 4.0, Smart City Development and Smart Services.
2. Providing experience of working with real time applications of Internet of Things to the learner.
3. Make a learner easily land up to a job role of either IoT Developer, IoT Architect in IT Industry.

Course Overview

The Course covers –

1. Internet of Things Basics
2. IoT Hardware – Arduino, Raspberry Pi
3. Communication Modules – HC05, ESP8266
4. HTTP, MQTT and CoAP
5. Node-Red
6. AWS IoT
7. IBM Bluemix and IBM Watson IoT
8. IoT Analytics

Course Outcome

After completion of this course –

1. The learner will get sound understanding of core concepts and sub domains of IoT and Industry 4.0
2. Learner will get proficiency in writing codes for developing IoT Gateway, collecting telemetry data and visualizing data.
3. Learner will be able to land up in a job role of an IoT Professional, working on IoT Projects.
4. The Learner can also easily switch from existing job role with around of 20% hike from the current salary switch to any of the field where IoT and Industry 4.0 techniques is being used.

Course Code (to be filled by TechTrunk Ventures)

TTV/IND/00027

Duration

54 Hours for online Live Training

Modules

18 Modules (3 Hours Each for online Training)

Prerequisite

1. Basic Understanding of any Programming Language.

	2. Basic understanding of electronics will be an added advantage
Machine Requirement	Windows Machine (Windows 7 or Above) /Linux Machine 4 GB RAM
Software used	Python 3.x Arduino VNC
Software Free/Licensed	FREE
If licensed, Is demo version available	FREE
Download link	Python 3.x https://www.python.org/ftp/python/3.7.0/python-3.7.0.exe More python packages needs to be installed, the details of which will provided to the learner Arduino https://downloads.arduino.cc/arduino-1.8.5-windows.exe
Any extra hardware other than PC required (If Yes kindly mention the list of hardware components required)	YES The Hardware kits will be provided by TechTrunk Ventures Pvt Ltd The kit includes following components – <ol style="list-style-type: none"> 1. Arduino Uno 2. USB Type II Cable 3. IR Proximity Sensor 4. DHT11 Module 5. MQ2 Gas Sensor 6. HC05 7. ESP8266 8. Breadboard 9. LEDs 10. Resistors 11. Connecting Wires 12. Raspberry Pi 3 13. Micro SD Card Class 10 – 16GB 14. Card Reader 15. Micro USB Cable 16. Ethernet Cable 17. 12V Relay Module 18. Bulb
Hands on	80%
Projects Covered	5

12 Possible Project (Number of projects covered will be the count mentioned in above)

1. Smartphone Controlled Home Automation over Bluetooth
2. IoT Gateway over XBee and CoAP
3. Smart Factory Sensor Data Visualization & Analytics using IBM Bluemix & Node-red
4. Industrial IoT – Alert Generation using AWS IoT and AWS SNS
5. Smart Parking management system using Raspberry Pi, Arduinos, WAMP and MQTT
6. IoT Gateway using MQTT and Raspberry Pi
7. Weather Station using ESP8266 and Thingspeak open IoT Platform
8. Smart Home Automation using Thingsboard
9. Factory Data Visualization using IBM Watson IoT
10. Industrial IoT using Siemens PLC and Raspberry Pi with Microsoft Azure IoT

Study Material

1. PPTs
2. Practice Examples
3. Reading Material in softcopy
4. Project Codes

Suggested relevant courses after taking this course:

1. IoT Analytics
2. IoT with AWS

Suggested Job Profile after taking this course:

1. IoT Product Manager
2. IoT Developer
3. IoT Architect
4. Industrial Data Scientist
5. Industry 4.0 Architect
6. Chief IoT Officer
7. Industrial Network Engineer
8. IoT Cloud Architect

Any other relevant information

None

Detailed Content:

<p>Module 1 Introduction to IoT Duration: 3 Hours</p>	<p>Introduction to Internet of Things M2M towards IoT -the global context Scope of IoT - Smart home, Smart Grid Applications IoT in India - Reality v/s Hype IoT Job Market Skills required to switch career to IoT Industries working on IoT IoT Products by Indian Companies Internet of Things in Indian Universities Curriculum Applications of IoT Electrical Engineering IoT Standards in Industry IoT Hardware Requirements Analysis of Arduino Uno, Arduino Yun, Raspberry Pi, Beaglebone Black, Intel Edision & Galileo</p>
<p>Module 2 Hardware Layer - Arduino Duration: 3 Hours</p>	<p>Industrial Internet of Things Working with Smart Grid – Analysis Getting started with Arduino Uno R3 Basics of AVR MCU - RAM, Flash Memory and timers Arduino – Opensource Hardware Platform Pin Configuration and functionalities Getting started with Arduino IDE LED Interfacing with Arduino Introduction to Serial Communication PC Controlled Communication Introduction to basic sensors Sensor 1: Working & Interfacing of IR Proximity Sensor</p>
<p>Assignment 1</p>	
<p>Module 3 Hardware Layer – Sensor Interfacing Duration: 3 Hours</p>	<p>Sensor 2: Working & Interfacing of MQ2 Sensor Sensor 3: Ultrasonic Sensor Interfacing (demo) Sensor 4 & 5: DHT11 Interfacing, working principle Measuring temperature & Humidity using DHT11 Analyzing sensor data on Serial Monitor & Serial Plotter Selecting a sensor for your use case Commercial/Industrial/Military/Medical/Food grade sensors Automatic Street Light Management for Smart Cities Understanding Wastage of Electrical Energy due to street lights mismanagement. Traffic Light Management Automation System</p>

<p>Module 4 Network Layer – Wireless Communication Protocols & Bluetooth</p> <p>Duration: 3 Hours</p>	<p>IPv4 Vs IPv6 Introduction to 6LowPAN IoT Physical Layer Protocols</p> <ul style="list-style-type: none"> - Bluetooth - WiFi - NFC - Zigbee - Cellular - SigFox - Thread <p>Getting started with HC05 – Bluetooth Module Connecting HC05 with Arduino Sensor Data Analytics using readily available Bluetooth Terminal Android Apps Android Controlled Device Automation with Arduino Working with Relay & Interfacing with Arduino Controlling AC Appliances with from PC – SMART Home Applications</p>
<p>Assignment 2</p>	
<p>Module 5 Network Layer - WiFi</p> <p>Duration: 3 Hours</p>	<p>Using Voice Recognition Technique Sending voice to text from android app via Bluetooth to arduino Voice controlled Device Automation Wifi & Lifi Getting Started with ESP8266-01 Configuration, Pin Layout and Applications Testing AT Commands with ESP8266 Connecting to a network HTTP Request Format Making HTTP Local Webserver using ESP8266</p>
<p>Module 6 ESP8266 & Thingspeak</p> <p>Duration: 3 Hours</p>	<p>Using ESP8266 as a HTTP Client Uploading live sensor data on thingspeak cloud using ESP8266 & GET Request Making a Local Webserver using Arduino Using Arduino as a TCP data server Accessing UI in a local network Analyzing HTTP callbacks in webserver Projects and Tasks Introduction to Transport Layer Protocols</p> <ul style="list-style-type: none"> - TCP - UDP

Assignment 3

Module 7 IoT Application Layer Protocol Duration: 3 Hours	IoT Application Layer Protocols <ul style="list-style-type: none">- HTTP- MQTT- XMPP- CoAP- AMQP- Websockets Getting started with MQTT MQTT v/s HTTP Understanding publish Subscribe Model Using eclipse.org as a MQTT broker Using secure MQTT Broker – io.adafruit.com Publishing data to the broker Subscribing data on a topic
Module 8 Python Programming Duration: 3 Hours	Getting started with Python Variables, and Data Structure List, tuples and dictionary Functions in python Control Structure Object Oriented Programming Using Packages Os, time and datetime File Handling in Python Miscellaneous Functions in python
Module 9 Python Programming Duration: 3 Hours	Serial Communication in Python Controlling Arduino using Python Interfacing APIs with Python MQTT with Python Installing Paho Publish data to a MQTT topic using Paho Subscribing to an MQTT Topic using Paho

Assignment 4

<p>Module 10 Raspberry Pi</p> <p>Duration: 3 Hours</p>	<p>Getting Started with Raspberry Pi Installing OS in Rpi Command line and GUI Interface Raspbian OS Introduction & Tools Interfacing GPIOs with LEDs Interfacing sensors Serial Communication Controlling Arduino from raspberry pi</p>
<p>Module 11 Raspberry Pi</p> <p>Duration: 3 Hours</p>	<p>Getting started with MQTT on Raspberry Pi Controlling LED using Android MQTT Client Getting sensor data using Android MQTT Client Using Raspberry pi as HTTP Client to send live sensor data to thingspeak Installing Mosquitto on Raspberry pi Making pi a local MQTT broker Testing Publish and subscribe model on RPi Publishing data from PC, Android to RPi over a local network Controlling Pi GPIOs using iot.eclipse.org MQTT broker</p>
<p>Module 12</p> <p>IoT Gateway and Node-red</p> <p>Duration: 3 Hours</p>	<p>Designing the IoT Gateway system Gathering data from multiple publishers Making Raspberry Pi as a IoT Gateway Analyzing sensor data in smartphone over internet Introduction to Node-red and node.js Getting started with node-red Installing dashboard, ThingSpeak node and IBM Watson node Basic flow in node-red Connecting twitter with trigger switch Twitting Sensor data on Twitter Uploading Sensor data on Thingspeak using node-red Uploading data to IBM Watson demo Platform using node-red Controlling devices from Twitter and other cloud services via node-red Creating front end Visualization using node-red</p>

<p>Module 13</p> <p>Socket Programming</p> <p>Duration: 3 Hours</p>	<p>Socket programming with python</p> <p>TCP v/s UDP</p> <p>Setting up TCP server & TCP client on Raspberry Pi using python code and socket Programming</p> <p>Testing TCP client server relationship</p> <p>Setting up UDP server and UDP client on RPi using Python code and socket programming</p> <p>Testing UDP client server relationship</p> <p>CoAP Protocol (Constrained Application Protocol)</p> <p>Working of CoAP</p> <p>HTTP v/s CoAP</p> <p>Using CoAPthon library with python</p> <p>Setting up a CoAP server using CoAPthon</p> <p>Setting up CoAP client using CoAPthon</p> <p>Client server relationship using CoAPthon</p>
<p>Module 14</p> <p>Websockets</p> <p>Duration: 3 Hours</p>	<p>Working of XMPP</p> <p>Working of Websockets</p> <p>Working of AMQP Protocol</p> <p>Making Arduino publish sensor data to a MQTT broker</p> <p>Getting started with JavaScript</p> <p>Introduction and basic programming using JavaScript</p> <p>Websocket Programming using JS</p> <p>Streaming data from an MQTT broker using websocket port</p> <p>Streaming live sensor data from MQTT broker on a personal webpage</p>
<p>Assignment 5</p>	
<p>Module 15</p> <p>AWS IoT</p> <p>Duration: 3 Hours</p>	<p>Introduction to AWS IoT</p> <ul style="list-style-type: none"> - Create a Device in the Thing Registry - Secure Communication Between a Device and AWS IoT - Verify MQTT Subscribe and Publish - Configure and Test Rules - Use the Device Registry and Device Shadows <p>Device Registry</p> <ul style="list-style-type: none"> - Identity in AWS IoT - Authorization <p>Rules</p> <ul style="list-style-type: none"> - Granting AWS IoT the Required Access - Creating an AWS IoT Rule - Troubleshooting a Rule - AWS IoT Rule Actions

<p>Module 16 AWS IoT</p> <p>Duration: 3 Hours</p>	<p>Topics</p> <ul style="list-style-type: none"> - Device Shadows - Device Shadows Data Flow - RESTful API - MQTT Pub/Sub Messages - Error Messages <p>AWS IoT SDKs</p> <ul style="list-style-type: none"> - Device SDK - Miscellaneous & Troubleshooting - Diagnosing Connectivity Issues - Diagnosing Rules Issues <p>Integrating AWS IoT with AWS SNS to trigger email, SMS Integrating DynamoDB with AWS IoT Case Studies on IoT based projects & implementations Discussion about current Challenges in IoT</p>
<p>Assignment 6</p>	
<p>Module 17 Industrial IoT</p> <p>Duration: 3 Hours</p>	<p>Industrial Internet of Things Smart Factory Concept Automation to Digitalization Platforms for Smart Industry Case Studies on Smart Industries Getting started with IBM Watson IoT Connecting Raspberry Pi to send telemetry data on IBM Watson IoT Creating visualization dashboard using IBM Watson IoT Creating triggers Working with IIoT Usecases.</p>
<p>Module 16 Projects</p> <p>Duration: 3 Hours</p>	<p>Project: Smart Parking Collecting telemetry data on IoT Gateway Storing data into MySQL database Creating a client app Accepting the client request Replying the request End to End Application</p>

<p>Module 17 IoT Analytics</p> <p>Duration: 3 Hours</p>	<p>IoT Analytics Smart Factory Dataset Analyzing sensor data Using pandas for statistical analysis Data Visualization using matplotlib and seaborn Finding why machines get damaged</p>
<p>Assignment 7</p>	
<p>Module 18 Project</p> <p>Duration: 3 Hours</p>	<p>Project: Smart Factory Deploying a nodered app on IBM Bluemix Collecting telemetry data over MQTT Creating visualization dashboard Analyzing Sensor Data Creating control dashboard Controlling devices remotely</p> <p>Real-World Design Constraints Introduction Technical Design constraints Data representation and visualization Interaction and remote control IoT Product Design Hardware Design Consideration in terms of Power consumption, Security, Memory requirement, Data-rate, run-time and protocols constraints. Selection of H/W & S/W platforms based on use case Case Studies Projects, Q & A Session</p>

Thank you for query

For any query please feel free to reach us

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