Course Content: Industrial Internet of Things (IIoT) 4.0

Lesson 01: Introduction to Internet of Things

- Introduction to internet of things
- Architecture of IoT
- IoT product cycle
- IoT case studies
- Concept of smart city
- M2M towards IoT- the global market
- Skills required to switch career to IoT
- Industries working on IoT
- IoT hardware requirements
- Which hardware to choose for IoT applications
- Analysis of Arduino Uno, Raspberry pi, Beagle bone Black, Intel Edition & Galileo

Lesson 02: Introduction to Arduino Uno

- Introduction to Arduino Uno
- Pin Configuration of Arduino Uno
- Introduction to Arduino IDE & Board Setup for Arduino Uno
- Writing program for LED Interfacing & different patterns
- Understanding different configuration of Switches
- Interfacing switch module with LED module

Lesson 03: Introduction to Serial Monitor

- Concept of serial monitor
- Understanding the graph plotting on serial monitor
- Introduction to conditional statements
- Building a prototype for banking counter system using serial monitor

Lesson 04: Introduction to 7 Segments

- Introduction to 7 segments
- Interfacing 7 segments with Arduino UNO
- Building a working prototype using 7 segments
- Interfacing switch and 7 segments

Lesson 05: Analog to Digital Conversion and PIR Sensor

- Introduction to analog to digital conversion

- Resolution determination
- Introduction to PIR Sensor
- Understanding the working of PIR
- Interfacing PIR with Arduino Uno
- Building a motor detection system for smart house

Lesson 06: PWM concept

- Concept of PWM
- Implementation of PWM
- Effect of PWM on LED
- Generating PWM with different duty cycle
- Effect of PWM on DC Motor
- Case study on PWM & how industry using PWM in their application

Lesson 07: Introduction to Touch sensor

- Introduction to touch sensor
- Interfacing touch sensor with Arduino UNO
- Introduction to DHT11 sensor
- Interfacing DHT11 with Arduino UNO
- Representation of Humidity & Temperature on serial monitor

Lesson 08: Introduction to Ultrasonic and Alphanumeric Sensor

- Introduction to Ultrasonic sensor
- Interfacing ultrasonic sensor with Arduino UNO
- Introduction to Alphanumeric LCD
- Interfacing LCD with Arduino UNO

Lesson 09: Introduction to Nodemcu

- Introduction to Nodemcu
- Pin configuration of Nodemcu
- Internal architecture of NodeMCU
- Arduino IDE setup for NodeMCU
- Interfacing LED with NodeMCU & different Pattern
- Interfacing switch module with LED
- Interfacing basic sensor with Nodemcu

Lesson 10: Introduction to Local Server and HTTP

- Concept of local server connectivity

- Definition of local server & http introduction
- http ports
- Local server implementation
- Connecting NodeMCU to local server

Lesson 11: Introduction to Web Development

- Introduction to web development
- Basic of HTML
- Basic HTML tags
- Block level elements
- Ordered List
- Unordered List
- Definition List
- Simple UI designing
- User input form designing
- Adding multi-pages to Local server
- Controlling devices over local network

Lesson 12: DOM HTML

- Introduction
- DOM HTML
- DOM CSS
- DOM Events
- NodeMCU web hosting
- Control device through web page
- Making HTTP Local Webserver using ESP8266

Lesson 13: Dashboard

- Dashboard 1
- Dashboard 2
- Dashboard 3
- Dashboard 4
- Dashboard 5
- Dashboard 6
- Dashboard 7

Lesson 14: Device control by Blynk sever

- Introduction to Blynk server
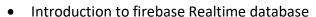- Controlling device using Blynk server

- Controlling LED using Android/iOS mobile application
- Using voice recognition technique
- Voice controlled home automation
- Configuring pin layout
- PWM effect using mobile application – Blynk server

Lesson 15: Introduction to ThingSpeak

- Introduction to ThingSpeak
- Introduction to field data & channel creation
- Uploading live sensor data on ThingSpeak cloud using esp8266& GET request
- Using nodemcu as a TCP data server
- Analyzing http call backs in webserver

Lesson 16: Introduction to JavaScript and Firebase

- Introduction to JavaScript
- Syntax
- Statements
- Comments
- Enabling in various Browsers
- Introduction to console
- Operators
- Arithmetic
- Assignment
- Comparison
- Logical
- Conditional statements
- if
- if-else
- Nested if
- Switch
- Loops
- While
- do-while
- for statement
- for - in – statement
- Functions
- User-defined Functions
- Function Syntax
- Function with Arguments
- Returning Values from Functions
- Built-in Functions

- Introduction to firebase Realtime database
- Testing firebase API with JavaScript application
- Sending web form data from JavaScript file to firebase database
- Making a full fledge firebase application with firebase

Lesson 17: Introduction to Firebase application

- Firebase web application hosting
- Firebase command line commands
- Firebase sever hosting rules and methods
- Firebase authentication
- Setting rules and adding user to the firebase application
- Building complete client application to control devices

Lesson 18: Introduction to Python

- Introduction to Python
- Getting started with Python
- Variables, and Data Structure
- List, tuples and dictionary
- Functions in python
- Control Structure
- File handling

Lesson 19: Introduction to Raspberry Pi

- Getting started with Raspberry Pi
- Installing OS in RPI
- Command line and GUI interface
- Raspbian OS introduction and tools
- Interfacing GPIO with LED
- Interfacing switch and LED module
- Interfacing DHT11 sensor with RPI
- Interfacing PIR sensor with RPI

Lesson 20: RPI applications/Introduction to MQTT

- Interfacing Touch sensor with RPI
- Making a complete application using RPI on putty
- Introduction to MQTT
- Message

- Topic
- Broker
- Subscriber
- Publisher

Lesson 21: RPI/MQTT/Introduction to Node RED

- Publishing/subscribing data on RPI
- Connecting NodeMCU to RPI using MQTT
- Using Adafruit library (NodeMCU) to communicate to RPI
- Introduction to Node RED
- Using Node RED to controlling devices on raspberry pi
- Making a device controlling dashboard using Node RED
- Using MQTT and Node RED to control devices over RPI

Lesson 22: Designing IoT Gateway System

- Designing the IoT gateway system
- Gathering data from multiple publishers
- Making RPI as IoT gateway
- Basic flow in Node RED
- Controlling devices with Node RED
- Creating front end for real-time data visualization

Lesson 23: Introduction to AWS IoT

- Introduction to AWS IoT
- Device shadow
- Device shadow data flow
- RESTful API
- MQTT pub/sub messages
- Error messages
- Introduction to thing
- Creating certificates for the device/thing
- Introduction to policy implementation and attachment with certificate and thing
- AWS IoT SDK

Lesson 24: Device SDK, Troubleshooting/Diagnosing

- Device SDK
- Troubleshooting
- Diagnosing connectivity issues

- Diagnosing rules
- Implementing MQTT publish and subscribe model
- Setting up RPI for AWS IoT SDK
- MQTT-Fx for testing IoT Certificates

Lesson 25

- Introduction to MobaXterm
- Integrating AWS IoT with AWS SNS
- Client email & Mobile SMS triggering
- Integrating DynamoDB with AWS IoT
- Case studies on IoT based projects
- Discuss about the current challenges in the IoT