Internet of Things Syllabus

Introduction & Concepts

1. Introduction
   Definition & Characteristics of Iot

2. Physical Design of Iot
   Things in Iot
   Iot Protocols

3. Logical Design Of Iot
   Iot Functional Blocks
   Iot Communication Models
   Iot Communication APIs

4. Iot Enabling Technologies
   Wireless Sensor Networks
   Cloud Computing
   Big Data Analytic
   Communication Protocols
   Embedded Systems

5. Iot Levels & Deployment Templates
   Iot Level-1
   Iot Level-2
   Iot Level-3
   Iot Level-4
   Iot Level-5
Iot Level-6

Domain Specific Iots

1. Introduction

2. Home Automation
   Smart Lighting
   Smart Appliances
   Intrusion Detection
   Smoke/Gas Detectors

3. Cities
   Smart Parking
   Smart Lighting
   Smart Roads
   Structural Health Monitoring
   Surveillance
   Emergency Response

4. Environment
   Weather Monitoring
   Air Pollution Monitoring
   Noise Pollution Monitoring
   Forest Fire Detection
   River Floods Detection

5. Energy
   Smart Grids
   Renewable Energy Systems
   Prognostics

6. Retail
   Inventory Management
   Smart Payments
Smart Vending Machines

7. Logistics
   Route Generation & Scheduling
   Fleet Tracking
   Shipment Monitoring
   Remote Vehicle Diagnostics

8. Agriculture
   Smart Irrigation
   Green House Control

9. Industry
   Machine Diagnosis & Prognosis
   Indoor Air Quality Monitoring

10. Health & Lifestyle
    Health & Fitness Monitoring
    Wearable Electronics

**IoT and M2M**

1. Introduction
2. M2M
3. Difference between IoT and M2M
4. SDN and NFV for IOT
   - Software Defined Networking
   - Network Function Virtualization

**IoT System Management with NETCONF-YANG**

1. Need for IoT Systems Management
2. Simple Network Management Protocol(SNMP)
DEVELOPING INTERNET OF THINGS

Iot Platforms Design Methodology

1. Introduction
2. Iot Design Methodology
   - Purpose & Requirements Specification
   - Process Specification
   - Domain Model Specification
   - Service Specification
   - Iot Level Specification
   - Functional View Specification
   - Operational View Specification
   - Device & Component Integration
   - Application Development
3. Case Study on IoT System for Weather Monitoring
4. Motivation for Using Python

IoT Systems-Logical Design using Python

1. Introduction
2. Installing Python
3. Python Data Types & Data Structures
Numbers
Strings
Lists
Tuples
Dictionaries
Type Conversion’

4. Control Flow
   if
   for
   while
   range
   break/continue
   pass

5. Functions
6. Modules

7. Packages

8. File Handling

9. Date/Time Operations

10. Classes

11. Python Packages of Internet Of Things

12. JSON

13. XML

14. HTTPLib & URLLib

15. SMTPLib

**IoT Physical Devices & Endpoints**

1. What is an IoT Devices
   Basic building blocks of an IoT Devices
2. Exemplary Device: Raspberry Pi
3. About the Board
4. Linux on Raspberry Pi
5. Raspberry Pi Interfaces
   Serial
   SPI
   I2C
6. Programming Raspberry Pi with Python
   Controlling LED with Raspberry Pi
   Interfacing an LED and Switch with Raspberry pi
   Interfacing a Light Sensor(LDR) with Raspberry Pi
7. Other IoT Devices
   pcDuino
   BeagleBone Black
   Cubieboard

**IoT Physical Servers & Cloud Offerings**

1. Introduction to Cloud Storage Models & Communication APIs
2. WAMP- AutoBahn for IoT
3. Xively Cloud for IoT
4. Python Web Application Framework-Django
   Django Architecture
   Starting Development with Django
5. Designing a RESTful Web API
6. Amazon Web Services for IoT
   Amazon EC2
   Amazon AutoScaling
   Amazon S3
   Amazon RDS
Amazon DynamoDB
Amazon Kinesis
Amazon SQA
Amazon EMR

7. SkyNet IoT Messaging Platform

**Case Studies Illustrating IoT Design**

1. Introduction

2. Home Automation
   - Smart Lighting
   - Home Intrusion Detection

3. Cities
   - Smart Parking

4. Environment
   - Weather Monitoring Systems
   - Weather Reporting Bot
   - Air Pollution Monitoring
   - Forest Fire Detection

5. Agriculture
   - Smart Irrigation

6. Productivity Applications
   - IoT Printer

**Advanced Topics**

**Data Analytics for IoT**

1. Introduction

2. Apache Hadoop
MapReduce Programming Model
Hadoop MapReduce Job Execution
MapReduce Job Execution Workflow
Hadoop Cluster Setup

3. Using Hadoop MapReduce for Batch Data Analysis
   Hadoop YARN

4. Apache Oozie
   Setting up Oozie
   Oozie Workflows for IoT Data Analysis

5. Apache Spark

6. Apache Storm
   Setting up a Storm Cluster

7. Using Apache Storm for Real-time Data Analysis
   REST-based approach
   WebSocket-based approach

8. Structural Health Monitoring Case Study

**Tools for IoT**

1. Introduction

2. Chef
   Setting up Chef

3. Chef Case Studies
   Multi-tier Application Deployment
   Hadoop Cluster
   Storm Cluster

4. Puppet

5. Puppet Case Study-Multi-tier Deployment

6. NETCONF-YANG Case Studies
   Steps for IoT Management with NETCONF-YANG
Managing Smart Irrigation IoT System with NETCONG-YANG

Managing Home Intrusion Detection IoT System with NETCONG-YANG

7. IoT Code Generator