Architecture and Technologies for Internet of Things

UNIT I: Internet of things: An overview – Internet of things, IoT conceptual framework, IoT architectural view, Technology behind IoT, Sources of IoT, M2M communication, Examples of IoT. Key concepts, Learning Outcomes, Exercises. Design Principles for Connected Devices – Introduction, IoT/M2M Systems layers and Designs Standardization, Communication Technologies, Data Enrichment, Data Consolidation and Device management at gateway, Ease of doing and Affordability.

UNIT II: Design Principles for Web Connectivity – Introduction, Web Communication Protocols for Connected Devices, Message communication Protocols for Connected Devices, Web Connectivity for Connected-Devices Network using Gateway, SOAP, REST, HTTP, RESTful and Web Sockets. Key Concepts, Learning Outcomes, Exercises. Internet Connectivity Principles – Introduction, Internet Connectivity, Internet-Based Communication, IP Addressing in the IoT, Media Access Control, Application Layer Protocols: HTTP, HTTPS, FPS, Telnet.

UNIT III: Data Acquiring, Organizing, Processing and Analytics – Introduction, Data Acquiring and Storage, Organizing the Data, Transactions, Business Processes, Integration and Enterprise Systems, Analytics, Knowledge Acquiring, Managing and Storing Processes. Key Concepts, Data Collection, Storage and Computing using a Cloud Platform – Introduction, Cloud Computing Paradigm for Data Collection, Storage and Computing, everything as a service and Cloud Service Models, IoT Cloud-Based Servicing using Xively, Nimbits and Other Platforms. Sensors, Participatory Sensing, RFIDs, and Wireless Sensor Networks – Introduction, Sensor Technology, Participatory Sensing, Industrial IoT and Automotive IoT, Actuator, Sensor Data Communication Protocols, Radio Frequency Identification Technology, Wireless Sensor Networks Technology. Prototyping the Embedded Devices for IoT and M2M – Introduction, Embedded Computing Basics, Embedded Platforms for Prototyping, Things Always Connected to the Internet or Cloud. IoT Privacy, Security and Vulnerabilities Solutions – Introduction, Security Requirements and Threat Analysis, Use Cases and Misuse Cases, IoT Security Tomography and Layered Attacker Model, Identity Management and Establishment, Access Control and Secure Message Communication, Message Communication, Security Models, Profiles and Protocols for IoT.

UNIT IV: IoT Platforms Design Methodology: Introduction, IoT Design Methodology – Purpose and Requirements Specification, Process Specification, Domain Model Specification, Information Model Specification, Service Specification, IoT Level Specification, Functional View Specification, Operational View Specification, Device & Component Integration, Application Development, Case Study on IoT System for weather Monitoring, Motivation for Using Python. IoT Systems – Logical Design Using Python, Introduction, Installing Python, Python Data Types & Data Structures – Numbers, Strings, Lists, Tuples, Dictionaries, Type Conversions, Control Flow – if, for, while, range, break/continue, pass, Functions, Modules, Packages, File Handling, Date/Time Operations, Classes, Python Packages of Interest for IoT – JSON, XML, HTTPLib & URLLib, STPLib.

UNIT V: IoT Physical Devices & Endpoints : What is an IoT Device – Basic building blocks of an IoT Device, Exemplary Device - Rasberry Pi, About the Board, Linux on Rasberry Pi, Rasberry Pi Interfaces, Serial, SPI,I2C,Programming Rasberry Pi with Python – Controlling LED with Rasberry Pi, Interfacing an LED and Switch with Rasberry Pi, Interfacing a Light Sensor(LDR) with Rasberry Pi, Other IoT Devices - pcDuino, BeagleBone Black, Cubieboard. Case Studies Illustrating IoT Design : Introduction, Home Automation – Smart Lighting, Home Intrusion Detection, Cities – Smart Parking, Environment – Weather Monitoring System, Weather Reporing Bot, Air Pollution Monitoring, Forest Fire Detection, Agriculture - Smart Irrigation, Productivity Applications – IoT Printer.

TEXTBOOKS:

1. Internet of Things: Architecture and Design Principles - Raj Kamal, McGraw Hill Publication, First Edition, 2017.
2. Internet of Things: Hands on Approach – Arshdeep Bagha, Vijay Madisetty, University Press, First Edition, 2015.

REFERENCE BOOKS:

1. The Internet of Things: Key Applications and Protocols – Olivier Hersent, David Boswarthick, Omar Elloumi, Wiley Press, Second Edition,2015.
2. Designing the Internet of Things – Adrian Mcewen, Hakin Cassemalli, Wiley Press, Second Edition, 2015.

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