

NIRMA UNIVERSITY
SCHOOL OF TECHNOLOGY, INSTITUTE OF TECHNOLOGY
M.Tech. in Electronics and Communication Engineering (Embedded System)
M.Tech. Semester - II
Department Elective III

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| Course Code | 3EC32D303 |
| Course Title | Internet of Things |

Course Outcomes (COs):

At the end of the course, students will be able to -

1. Design framework for Internet of Things (IoT) for given applications using suitable sensor, microcontroller, and communication protocol and cloud architecture.
2. Comprehend sensor types, power management, IP based and non-IP based WLAN, WPAN and WWAN communication protocols and cloud messaging protocols related to IoT.
3. Evaluate the performance of cloud service models for the given IoT based applications.

Syllabus:

Teaching Hours:

UNIT I: Introduction of IoT

03

Definition, Growth, Architecture Overview, Building an architecture, Application areas, Characteristics, Threats and security, design principles and needed capabilities, standard considerations, Machine to Machine and IoT Technology Fundamentals - Devices and gateways, Local and Wide Area Networking.

UNIT II: Sensor, Microcontroller and Power Management

07

Sensors for temperature, light, pressure, humidity; LiDAR, Hall effect sensor, PIR sensor, MEMS sensors, Vision system – CCD and CMOS, Sensor fusion, Case study – Sensor tag energy harvesting, batteries and super capacitors, interfacing of sensors with microcontroller

UNIT III: Communication Protocols

06

Non-IP based WPAN – IEEE 802. 15. 1 Bluetooth, Bluetooth low energy (BLE 4.0), Beacon Technology, Bluetooth Mesh, Bluetooth Smart 5.0, IEEE 802.15.4 WPAN, Zigbee, Z-wave, Internet Protocol (IP) based WPAN and WLAN – 6LoPAN, WPAN with IP-thread

UNIT IV: IoT Edge to Cloud Protocols

06

Message Queuing Telemetry Transport (MQTT)- Publish-Subscribe Operation, Packet Structure, MQTT-SN, Transport Layer (TCP, MPTCP, UDP, DCCP, SCTP)-(TLS, DTLS) – Session Layer-HTTP, *Constrained Application Protocol* (CoAP), Extensible Messaging and Presence Protocol (XMPP), Advanced Message Queuing Protocol (AMQP).

UNIT V: Cloud Computing

05

Cloud service models – Network as a Service (NaaS), Software as a Service (SaaS), Platform as a Service (PaaS), Internet as a Service (IaaS), Public, private and hybrid cloud, OpenStack cloud architecture.

UNIT VI: Case Study

03

IoT for Healthcare domain, IoT for Smart City applications.

Self-Study:

The self-study contents will be declared at the commencement of semester. Around 10% of the questions will be asked from self-study contents.

Laboratory Work:

Laboratory work will be based on above syllabus with minimum 10 experiments to be incorporated.

Suggested Readings:

1. Perry Lea, Internet of Things for Architects, Packt.
2. Abhishek S Nagarajan, RMD Sundaram Shriram K Vasudevan, Internet of Things, Wiley.
3. Adrian McEwen, Hakim Cassimally Designing the Internet of Things, Wiley.
4. Rajkumar Buyya, Amir Vahid Dastjerdi, Internet of Things -Principles and Paradigms, Elsevier.
5. Arshdeep Bahga, Vijay Madiseti, Internet of Things: A Hands-on Approach, Universities Press.

L = Lecture, T = Tutorial, P = Practical, C = Credit