| **CSXX1909** | **Internet of Things** | **L-T-P-Cr: 3-0-2-4** |

Pre-requisites: Fundamentals of Wired/Wireless, Communication, Computer networks.

Objectives/Overview:
- To learn concepts of Internet of Things (IoT)
- To learn various applications of IoT and challenges involved in it
- To understand and learn different types of protocols and devices used in IoT
- To understand the implementation of IoT applications using Python/Arduino/Raspberry Pi

Course Outcomes:

At the end of the course, a student should:

S.NO	Outcome	Mapping to PO
CO-1	Familiarize with the basic concepts and terminology in Internet of Things	PO2
CO-2	Learn about various domains of IoT and its Design Methodology	PO1, PO3, PO7
CO-3	Understand the programming background for IoT Applications	PO2, PO3
CO-4	Identify the hardware and software requirements of IoT based solutions	PO3, PO4, PO6
CO-5	Learn about the various real time IoT Applications	PO2, PO4, PO6

UNIT I: **Lectures: 10**

Definition and Characteristics of IoT, Physical Design of IoT, Things in IoT, IoT Protocols, Logical Design of IoT: IoT Functional Blocks, IoT Communication Models and APIs, IoT Enabling Technologies, IoT Levels and Deployment Templates.

UNIT II: **Lectures: 8**

Domain Specific IoT: Home Automation, Logistics, Agriculture, Introduction to M2M, Difference between IoT to M2M, IoT Design Methodology, Need for IoT System Management, IoT design methodology, Case Study on IoT System for Weather Monitoring.

UNIT III: **Lectures: 10**

IoT Protocol Stack: Covers different protocols like 6LoWPAN, MQTT, SMQTT, CaAP, XMP, LoADng, Zigbee, Bluetooth, IEEE 802.15.4.

UNIT IV: **Lectures: 6**

IoT Physical Devices; Basic Building Blocks of an IoT device, Exemplary Device Raspberry Pi, Arduino Board, Beaglebone Black, Cubieboard.

UNIT V: **Lectures: 8**

Django- Python Web Application Framework, Designing RESTful Web API, Designing a Prototype for Smart City, Smart Parking and Smart Irrigation.

Text/Referance Books:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on Approach)", 1st Edition, VPT, 2014.
2. Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", First Edition, Cisco Press, USA.
3. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence, 1st Edition, Academic Press, 2014.
4. Bernd Scholz-Reiter, Florian Michahelles, "Architecting the Internet of Things", ISBN 978-3-642-19156-5 e-ISBN 978-3-642-19157-2, Springer
5. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118- 47347-4, Willy Publications