III Year I Semester	**L**	**T**	**P**	**C**
Code: 20EC5633	**3**	**1**	**0**	**4**

IOT AND IT'S APPLICATIONS

Course Objectives:

1. To understand Smart Objects and IoT Architectures.
2. To learn about various IoT-related protocols.
3. To build simple IoT Systems using Arduino and Raspberry Pi.
4. To understand data analytics and cloud in the context of IoT.
5. To develop IoT infrastructure for popular applications.
6. To learn how to design and implement IoT applications that manage big data, streaming data, and/or distributed data.

UNIT I: Fundamentals of IoT

Evolution of Internet of Things, Enabling Technologies, IoT Architectures: one M2M ,IoT World Forum (IoTWF) and Alternative IoT models, Simplified IoT Architecture and Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II: IoT Protocols

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4,802.15.4g,802.15.4e,1901.2a,802.11ah and LoRaWAN, Zigbee protocol, Network Layer: IP versions, Constrained Nodes and Constrained Networks, Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks, Application Transport Methods: Supervisory Control and Data Acquisition, Application Layer Protocols: CoAP and MQTT.

UNIT III: Design and Development

Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks, Arduino–Board details, IDE programming, Raspberry Pi and Interfaces.

UNIT IV: Data Analytics and Supporting Services

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest, Role of Machine Learning-NoSQL Databases, Hadoop Ecosystem, Apache Kafka, Apache Spark, Edge Streaming Analytics and Network Analytics, Xively Cloud for IoT, Python Web Application Framework, Django, AWS for IoT, System Management with NETCONF-YANG, Kibana, Fault-tolerant data processing on devices.

UNIT V: Case Studies/Industrial Applications

Cisco IoT system, IBM Watson IoT platform, Manufacturing, Converged Plant wide Ethernet Model (CPwE), Power Utility Industry, Grid Blocks Reference Model, Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control.

Course Outcomes:

A student who successfully fulfils this course requirement will be able to:

S. No	Course Outcome	BTL
1.	Understand the fundamentals of smart objects and IoT.	L2
2.	Analyze various protocols for IoT.	L4
3.	Design and develop an IoT system using Rasperry Pi/Arduino.	L5
4.	Apply data analytics and use cloud offerings related to IoT.	L3
5.	Analyze applications of IoT in real time scenario.	L4

Correlation of Cos with POs &PSOs:

CO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	1	-	-	-	-	-	-	-	-	-	2	-
CO2	2	3	1	-	-	-	-	-	-	-	-	-	3	-
CO3	1	3	2	1	1	-	-	-	-	-	-	-	3	1
CO4	1	2	3	1	1	-	-	-	-	-	-	-	3	1
CO5	1	3	2	1	1	-	-	-	-	-	-	-	3	1

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.
2. Arshdeep Bahga, Vijay Madisetti, Internet of Things – A hands-on approach, Universities Press, 2015.

Reference Books:

1. Olivier Hersent, David Boswarthick, Omar Elloumi, The Internet of Things – Key applications and Protocols, Wiley, 2012.
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis, Karnouskos, Stefan Avesand, David Boyle, From Machine-to-Machine to the Internet of Things–Introduction to a New Age of Intelligence, Elsevier, 2014.
3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), Architecting the Internet of Things, Springer, 2011.
4. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.