

INTERNET OF THINGS

II Semester: ECE(ES)								
Course Code	Category	Hours / Week			Credits	Maximum Marks		
BESC14	Core	L	T	P	C	CIA	SEE	Total
		3	1	0	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes:60			

I. COURSE OVERVIEW:

The Internet of Things (IoT) is everywhere. It provides advanced data collection, connectivity, and analysis of information collected by computers everywhere—taking the concepts of Machine-to-Machine communication farther than ever before. This course gives a foundation in the Internet of Things, including the components, tools, and analysis by teaching the concepts behind the IoT and a look at real-world solutions.

II. COURSE OBJECTIVES:

The students will try to learn:

- I. The fundamentals Smart Objects and IoT Architectures and learn about various IOT-related protocols.
- II. The build simple IoT Systems using Arduino and Raspberry Pi.
- III. The data analytics, cloud in the context of IoT and to develop IoT infrastructure for popular applications

III. COURSE OUTCOMES:

After successful completion of the course, students should be able to:

CO1	Understand the programming of microcontroller for the functional stack of IoT ecosystem.	Understand
CO2	Understand the concepts of data synchronization for agility and autonomy in protocols.	Understand
CO3	Apply IEEE 802.11 protocol for topology and security in physical and MAC layer.	Apply
CO4	Identify the applications of IoT including home automation, smart cities, and smart environment to implement the real time applications	Apply
CO5	Develop the cloud environment using web enabling constrained devices in Internet of things.	Create
CO 6	Make use of appropriate communication protocols to acquire the knowledge of programming with Raspberry PI	Apply

IV. SYLLABUS:

MODULE – I: Fundamentals of IoT(9)

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, 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.

MODULE – II: IoT Protocols IoT access technologies(9)

Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – 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.

MODULE – III: Design and development design methodology(9)

Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details

IDE programming -Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

MODULE – IV: Data analytics and supporting services(9)

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL 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 Developing.

MODULE – V:IoT Physical Servers and Cloud Offerings(9)

Introduction to cloud storage models and communication APIs; WAMP: AutoBahn for IoT, Xively cloud for IoT; Case studies illustrating IoT design: Home automation, smart cities, smart environment.

V. 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. ArshdeepBahga, Vijay Madisetti, “Internet of Things: A Hands-on-Approach”, VPT, 1st Edition, 2014.
3. Matt Richardson, Shawn Wallace, “Getting Started with Raspberry Pi”, O’Reilly (SPD), 3rd Edition, 2014.

VI. REFERENCE BOOKS:

1. Adrian McEwen, Hakim Cassimally, “Designing the Internet of Things”, John Wiley and Sons, 1st Edition, 2014.
2. Francis Da Costa, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, Apress Publications, 1st Edition, 2013.

VII. WEB REFERENCES:

1. <https://www.upf.edu/practice/en/3376/22580>.
2. <https://www.coursera.org/learn/iot>.
3. <https://bcourses.berkeley.edu>.
4. www.innovianstechnologies.com.
5. <https://mitpress.mit.edu/books/internet-things>
6. <http://www.apress.com>

VIII. E-TEXT BOOKS:

1. <https://mitpress.mit.edu/books/internet-things>
2. <http://www.apress.com>