22CST51 - INTERNET OF THINGS AND CLOUD COMPUTING							
Programme & Branch	**B.E. - Computer Science and Engineering**	**Sem.**	**Category**	**L**	**T**	**P**	**Credit**
Prerequisites	**NIL**	**5**	**PC**	**3**	**0**	**0**	**3**

Preamble	The course describes various communication protocols for IoT, IoT levels and design methodologies and illustrates the development of simple real time IoT applications. This course also demonstrates developing real-time IoT applications using AWS cloud services.	
Unit - I	**Introduction to Internet of Things:**	**9**
Definition and Characteristics of IoT, Physical Design of IoT – IoT Protocols, IoT Communication Models - IoT Communication APIs – IoT enabling Technologies- IoT Levels and Templates – Domain Specific IoT- IoT and M2M - IoT Platform Design methodologies.		
Unit - II	**Infrastructure and Service Discovery Protocols for the IoT System**	**9**
Low Power Wide Area Networking Technologies - Layered Architecture of IoT-Protocol architecture of IoT-Infrastructure Protocols – Device or Service Discovery for IoT – Protocols for IoT Service Discovery.		
Unit - III	**Python for IoT and Introduction to Raspberry Pi:**	**9**
Python packages for IoT-Introduction to Raspberry Pi – Interfaces (serial, SPI, 12C) Programming – Python program with Raspberry Pi (interfacing external devices) – controlling output – reading input from pins – connecting IoT to (ThingSpeak) cloud.		
Unit - IV	**Cloud for IoT Applications:**	**9**
Cloud computing Service models-Types of Cloud- Cloud Technology-Cloud Service Ecosystem-Cloud Enabled Environment-Cloud Inspired Enterprise Transformations- IoT and Cloud Inspired Smarter Environments- Hybrid Clouds- Federated Clouds-Special Purpose Clouds-The Emergence of Edge/Fog clouds-The Architectural Components of the Smarter Traffic System		
Unit - V	**AWS IoT: Developing and Deploying in Internet of Things:**	**9**
Introduction to AWS IoT-core-connecting to AWS IoT core – AWS IoT Tutorials – Managing devices with AWS IoT- Tagging AWS IoT resources – Rules – Device shadow service – storing & retrieving sensor data using storage service – Creation of web based application for device communication		
		Total:45

TEXT BOOK:

1.	Arshdeep Bahga and Vijay Madisetti, “Internet of Things - A Hands-on Approach”, Universities Press, 2015 for Units I & III.
2.	Pethuru Raj and Anupama C. Raman, “The Internet of Things: Enabling Technologies, Platforms, and Use Cases”, CRC Press, 2017, for Unit II & IV.
3	https://docs.aws.amazon.com/iot/latest/developerguide for Unit V.

REFERENCES:

1.	David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, “IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things”, 1st Edition, Cisco Press, 2017.
2.	Rajkumar Buyya, James Broberg & Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Edition, Wiley,, 2013.

COURSE OUTCOMES: On completion of the course, the students will be able to		**BT Mapped (Highest Level)**
CO1	analyze the suitability of various IoT System levels in providing an IoT-based solution for a given problem	Analyzing (K4)
CO2	demonstrate the role of IoT protocols in building IoT applications	Applying (K3)
CO3	make use of Raspberry Pi and the supporting Python packages to develop real-time IoT application	Applying (K3)
CO4	design smart applications using IoT with cloud computing services and deployment model	Applying (K3)
CO5	develop Real-time IoT applications using AWS cloud services	Applying (K3)

Mapping of COs with POs and PSOs

COs/ POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1	3	3	2										3	1
CO2	3	2	1										3	1
CO3	3	2	1									1	3	1
CO4	3	2	1									1	3	1
CO5	3	2	1									1	3	1

1 – Slight, 2 – Moderate, 3 – Substantial, BT- Bloom's Taxonomy

ASSESSMENT PATTERN – THEORY

Test / Bloom's Category*	**Remembering (K1) %**	**Understanding (K2) %**	**Applying (K3) %**	**Analyzing (K4) %**	**Evaluating (K5) %**	**Creating (K6) %**	**Total %**
CAT1	-	40	40	20			100
CAT2	-	50	50				100
CAT3	-	50	50				100
ESE	-	50	30	20			100

* ±3% may be varied (CAT 1, 2, 3 – 50 marks & ESE – 100 marks)