INTERNET OF THINGS			
Course Code:	CS401	**Course Credits:**	3
Course Category:	CC	**Course (U / P)**	U
Course Year (U / P):	4U	**Course Semester (U / P):**	7U
No. of Lectures + Tutorials (Hrs/Week):	03 + 00	**Mid Sem. Exam Hours:**	1
Total No. of Lectures (L + T):	45 + 00	**End Sem. Exam Hours:**	3

COURSE OBJECTIVES
1. Students will be explored to the interconnection and integration of the physical world in IoT.
2. Learning of networking concepts in IoT environment.
3. Understanding of various wireless network, topologies, IoT protocols.
4. Understanding of the importance of security issues in IoT.
5. Implementation of IoT in real life with learning of tools like MATLAB.

COURSE OUTCOMES
At the end of the course the students should be able to:
1. Understand about all concepts of Internet of Things.
2. Understand building blocks of Internet of Things and its characteristics.
3. Learn application protocols for IoT.
4. Able to understand the application areas of IoT.
5. Able to realize the revolution of Internet in Mobile Devices, Cloud & Sensor Networks.

UNIT I   INTRODUCTION TO IOT

Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT and OT, IoT Challenges, Drivers Behind New Network Architectures: Scale, Security, Constrained Devices and Networks, Data, Legacy Device Support.

UNIT II   IOT NETWORK ARCHITECTURE AND DESIGN

Comparing IoT Architectures: The one M2M IoT Standardized Architecture, The IoT World Forum (IoTWF) Standardized Architecture, Additional IoT Reference Models, A Simplified IoT Architecture, The Core IoT Functional Stack- Layer 1: Things: Sensors and Actuators Layer, Layer 2: Communications Network Layer, Layer 3: Applications and Analytics Layer, IoT Data Management and Compute Stack :Fog Computing , Edge Computing, The Hierarchy of Edge, Fog, and Cloud.

UNIT III   NETWORK AND APPLICATION PROTOCOLS FOR IOT

Wireless Communication Technologies: ZigBee, ESP8266, Introduction to sensors and modules - concept, layout, working, applications, Introduction of IoT Development Boards-Node MCU, Arduino, IoT Access Technologies 107IEEE 802.15.4, IEEE 802.15.4g and 802.15.4e, IEEE

1901.2a, IEEE 802.11ah, LoRaWAN, Constrained Devices, Constrained-Node Networks, Optimizing IP for IoT :From 6LoWPAN to 6Lo, Header Compression, Fragmentation, Mesh Addressing, Mesh-Under Versus Mesh-Over Routing, Authentication and Encryption on Constrained Nodes , Application Protocols for IoT: CoAP, Message Queuing Telemetry Transport (MQTT) .

UNIT IV   DATA ANALYTICS AND SECURITY OF IOT

An Introduction to Data Analytics for IoT, Structured Versus Unstructured Data, Data in Motion Versus Data at Rest, IoT Data Analytics Overview, IoT Data Analytics Challenges, Machine Learning : Machine Learning Overview Supervised Learning, Unsupervised Learning, Neural Networks, Securing IoT : Common Challenges in IoT Security, Device Insecurity, Network Characteristics Impacting Security, Security Priorities: Integrity, Availability, and Confidentiality, Formal Risk Analysis Structures: IAS OCTAVE, Top Vulnerabilities of Iot.

UNIT V. IMPLEMENTING IoT IN REAL LIFE

Interfacing sensors with development boards, communication modules with sensors, communication modules with development boards, MATLAB and Arduino Interfacing, Hands-on in IoT - various real life projects involving different boards, sensors, modules and communication technologies .

Text Books :

1. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things
   by Rob Barton, Gonzalo Salgueiro, David Hanes
2. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1stEdition,
   VPT, 2014.
3. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013