

Branch Name:	Artificial Intelligence & Data Science
Semester/Year:	Semester IV / Second Year
Subject Title:	Fundamental of Internet of Things
Subject Code:	1ET1080403
Pre-requisite:	Fundamentals of computer network, wireless sensor network, communication & Internet technology, web technology, information security.

Course Objective:

This course will enable students:

- To study Vision and Introduction to IoT.
- To understand IoT Market perspective.
- To understand Data and Knowledge Management and use of Devices in IoT Technology.
- To understand State of the Art – IoT Architecture.
- To learn Real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

Teaching Scheme (Hours per week)				Evaluation Scheme (Marks)				
Lecture (L)	Tutorial (T)	Practical (P)	Credit	Theory (Marks)		Practical (Marks)		Total (Marks)
				University Assessment	Continuous Assessment	University Assessment	Continuous Assessment	
03	-	02	04	70	30	30	20	150

Subject Contents				
Sr. No	Topic	Total Hours	Weight (%)	
1	IoT & Web Technology: The Internet of Things Today, Time for Convergence, Towards the IoT Universe, Internet of Things Vision, IoT Strategic Research and Innovation Directions, IoT Applications, Future Internet Technologies, Infrastructure, Networks and Communication, Processes, Data Management, Security, Privacy & Trust, Device Level Energy Issues, IoT Related Standardization, Recommendations on Research Topics.	07	20	
2	IoT Architecture -State of the Art – Introduction, State of the art: Architecture Reference Model- Introduction, Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.	06	16	
3	Design And Development: Design Methodology - 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.	07	18	

4	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 – 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, Protocols: Zigbee, LoRa WAN, RPL, CoRePL, : 6LoWPAN, CoAP and MQTT	07	18
5	Internet of Things Privacy, Security and Governance: Introduction, Overview of Governance, Privacy and Security Issues, Contribution from FP7 Projects, Security, Privacy and Trust in IoT- Data-Platforms for Smart Cities, First Steps Towards a Secure Platform, Smartie Approach. Data Aggregation for the IoT in Smart Cities, Security	08	20
6	IoT Applications for Value Creations: Home automation, Industry applications, Surveillance applications, Other IoT applications	04	8

Course Outcome:

On completion of this course, students will be able to:

- Explain the vision of IoT from a global context.
- Determine the Market perspective of IoT.
- Examine Devices, Gateways and Data Management.
- Describe the building state of the IoT architecture.
- Apply IoT in Industrial and Commercial Building Automation and Real World Design Constraints.

List of Suggested Experiments:

1. Define and Explain Eclipse IoT Project.
2. Sketch the architecture of IoT Toolkit and explain each entity in brief.
3. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
4. Explain application framework and embedded software agents for IoT toolkit.
5. Explain working of Raspberry Pi.
6. Connect Raspberry Pi with your existing system components.
7. Interface Raspberry Pi with python programming.

List of Text Book:

1. 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, (Chapters 1-4,8-10), Academic Press, 2014, ISBN: 9780080994017.
2. Dr. Ovidiu Vermesan, Dr. Peter Friess, “Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems”, River Publisher
3. 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

List of Reference Books:

1. Francis daCosta, “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, Apress Publications, 2013
2. Vijay Madisetti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014