

Branch Name:	Artificial Intelligence & Data Science
Program Code	ET108
Subject Title:	Fundamentals of Internet of Things
Subject Code:	2ET1080402T
Pre-requisite Course:	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 and Examination Scheme:

Credit	Teaching Scheme Hours per week				Evaluation Scheme (Marks)								Total (Marks)
					Theory (Marks)				Practical (Marks)				
	L	T	P	Total	SEE		CCA		SEE		CCA		
					Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	
3	3	-	-	3	24	60	16	40	-	-	-	-	100

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 LoRa WAN – 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, CORPL, : 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	08

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 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 Madiseti and Arshdeep Bahga, “Internet of Things (A Hands-on-Approach)”, 1st Edition, VPT, 2014

Course Learning Outcomes (CLO): On completion of this course, the students will be able to:

CLO	Description	Bloom's Taxonomy Level
CLO1	Explain the vision of IoT from a global context.	2 Understanding
CLO2	Determine the Market perspective of IoT.	1 Remembering
CLO3	Develop real life IoT based projects	2 Understanding,
CLO4	Describe the building state of the IoT architecture.	3 Applying, 2 Understanding
CLO5	Apply IoT in Industrial and Commercial Building Automation and Real World Design Constraints.	5 Evaluate, 3 Applying, 4 Analyze

Mapping of CLOs with POs & PSOs

Course Learning Outcomes	Program Outcomes(POs)												Program Specific Outcomes(PSOs)			
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CLO1	H	M	M	L	L	M			L				H	L		
CLO2		L	M	H	L	L					L	L	M	L		
CLO3	L	M	M	L	M	H		M		L			M	L		
CLO4	M	M	M	L	M	H		M	L				M	L		
CLO5	M	L	L	L	M	H		M		L			H	L		

H:High, M:Medium, L:Low