GUJARAT TECHNOLOGICAL UNIVERSITY

BE – Semester 7
Minor Degree : Electrical & Computer
Subject Code : 117AK01
Subject Name : Internet of Things

Type of course : Minor Degree

Prerequisite : Industrial Automation, Embedded Systems for Power Electronics,

Rationale: Smart devices fueled by the hyperconnected Internet of Things (IoT) are becoming ever more prevalent and pervasive in our personal lives. Sensors are everywhere, and the trend will only continue. Today, sensor-equipped industrial equipment is powered by artificial intelligence (AI). Medical devices, Automobiles, Home, and Industrial Automation will largely depend on IoT. In continuation with this, IoT will bring about a major change in almost all areas of electrical engineering also. So, study of concepts of IoT and its use in Electrical Engineering Applications will be helpful to electrical engineer.

Teaching and Examination Scheme :

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	2	4	70	00	30	00	100

Content :

Sr. No.	Content	Total Hours
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.	9
2	• M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. • M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.	9
3	• 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.	9
4	• IoT Applications for Value Creations Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT applications related to Oil and Gas Industry, home, industrial and building automation, Energy , Power System, Transportation, Smart Grid, Medical and Healthcare system etc.	9

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	9

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
20	**30**	**15**	**15**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application - N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

1. **Remembering:** Retrieving - recognizing - and recalling relevant knowledge from long-term memory.
2. **Understanding:** Constructing meaning from oral - written - and graphic messages through interpreting - exemplifying - classifying - summarizing - inferring - comparing - and explaining.
3. **Applying:** Carrying out or using a procedure for executing or implementing.
4. **Analysing:** Breaking material into constituent parts - determining how the parts relate to one another and to an overall structure or purpose through differentiating - organizing - and attributing.
5. **Evaluating:** Making judgments based on criteria and standards through checking and critiquing.
6. **Creating:** Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating - planning - or producing.

Note : This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.
Reference Books/Material:

1. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014
2. Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013
3. Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-44939357-1

Course Outcomes :

Sr. No.	CO statement After studying this subject, student will be able to	Topics Mapped	Marks % weightage
CO-1	understand the vision of IoT from a global context.	1,2	20
CO-2	determine the Market perspective of IoT	2	20
CO-3	use of Devices, Gateways and Data Management in IoT.	4	20
CO-4	understand governance, privacy and security issues related to IoT based systems.	5	20
CO-5	apply knowledge gained for IoT architecture of various automation applications.	3, 4	20

Laboratory/Practical Work :

Objectives: The laboratory work is aimed at putting the theory learnt in class in practice and to show that the results are matched with theory closely.

Directions for Laboratory work:

- ✓ The list of experiments is given as a sample.
- ✓ Similar laboratory work fulfilling the objectives can also be considered.
- ✓ The sample list of experiments is given below.

Suggested List of Experiments and Design Based (DP)/Open Ended Problems :

1. Define and Explain Eclipse IoT Project.
2. List and summarize few Eclipse IoT Projects.
3. Sketch the architecture of IoT Toolkit and explain each entity in brief.
4. Demonstrate a smart object API gateway service reference implementation in IoT toolkit.
5. Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.
6. Describe gateway-as-a-service deployment in IoT toolkit.
7. Explain application framework and embedded software agents for IoT toolkit.
8. Explain working of Raspberry Pi.
9. Connect Raspberry Pi with your existing system components.
10. Give overview of Zetta.
11. Study of various applications of IoT in Electrical Engineering

Software/Major Equipment:

List of Open-Source Software / learning website:

1. https://github.com/connectIOT/iottoolkit
2. https://www.arduino.cc/
3. http://www.zettajs.org/
4. Contiki (Open source IoT operating system)
5. Arduino (open source IoT project)
6. IoT Toolkit (smart object API gateway service reference implementation)
7. Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and sensors)
8. https://nptel.ac.in/courses/106/105/106105166/
9. https://nptel.ac.in/courses/108/108/108108098/
10. https://nptel.ac.in/courses/106/105/106105195/
11. https://www.edx.org/learn/iot-internet-of-things
12. https://www.coursera.org/learn/introduction-iot-boards

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