



# GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering

Subject Code: 3732307

Semester – III

Subject Name: IOT and Smart Cities

**Type of course: Master Of Engineering**

**Prerequisite:** Fundamentals of Internet & computer network, wireless sensor network, Internet technology Applications, Basic City development aspects, System of City Metropolitan Governance System parts

**Rationale:**

**Teaching and Examination Scheme:**

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

Sr. No.	Syllabus Content	No. of Hours
1	<b>The Internet of Things: An Overview &amp; Design Principles for Connected Devices:</b> The Flavor of the Internet, The Internet of Things, The Technology Of the Internet of Things, Calm and Ambient Technology, Web Thinking for Connected Devices: Small Pieces, loosely joined First Citizens on the Internet	6
2	<b>Thinking about prototyping &amp; Prototyping Embedded Devices:</b> Prototypes and Productions, Changing Embedded platforms. Electronics Sensors, Actuators. Embedded Computing Basics, Developing on Arduino & Developing on the Raspberry Pi, Developing on BeagleBone Black,	06
3	<b>IoT Applications for Value Creations</b> 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 For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth.	06
4	<b>The Imperative for Smart Cities:</b> A New Vision, What Is Smart?, A Sensitive Relationship , What Do We Really Want from the Smart City? ,Managing the Shift, Designing for People	4
5	<b>Technology, Innovation, and the Problem with People &amp; A New Perspective on Smart Cities:</b> Sensors to Services, What If My World Goes Down?, The Surprisingly Familiar Sensor, The Internet of Things ,The Smart City as Mediator. The Efficient, Effective, and Optimal City?, Smart City Design Goals, Engineering New Models for Investing in the Smart City, Context-Sensitive Technology Services, What About the Start-Up?	6
6	<b>Why Design Thinking?, Design Thinking Applied, Smart City Technologies:</b> Thinking About Thinking, How Does This Working Definition Work? How the Best Technology Fails and Where the Better Solution Wins, Rational Implementation. Ways That Design Thinking Has Been Used in Cities, When Urban Design Rises Above Imposition, Smart City Technologies Should Focus on Improving Human Society ,The Approach to Bringing New Technologies to the Smart City Is Time-Tested	6
7	<b>Smart City Planning and Management &amp; The Fundamentals of Smart Infrastructure:</b>	10



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Smart Cities and Their Role in the Creation of a National Identity, The Energy Opportunity, The Building Opportunity: New Models, New Ways Forward, The Urban Life Force: Transportation as Animating Principle, Innovative Transportation Services Transportation Analytics, The Most Powerful Sensor in the City Is in Your Pocket , Smart City Analytics: Analytical Models, The Analytics of Things, The Analytical Intersection of Human and Machine
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## Reference Books

1. Building Smart Cities , Analytics ,ICT, and Design Thinking, Carol L. Stimmel, CRC Press, <https://arthurlimantara.files.wordpress.com/2017/03/building-smart-cities.pdf>
2. Designing the Internet of Things , Adrian McEwen & Hakim Cassimally, Willey Reprint 2017
3. Vijay Madiseti and Arshdeep Bahga, “**Internet of Things (A Hands-on-Approach)**”,
4. 1<sup>st</sup> Edition, VPT, 2014.
5. Francis daCosta, “**Rethinking the Internet of Things: A Scalable Approach to Connecting Everything**”, 1<sup>st</sup> Edition, Apress Publications, 2013
6. Cuno Pfister, Getting Started with the Internet of Things, O’Reilly Media, 2011, ISBN: 978-1-4493-9357-1
7. 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**”, 1<sup>st</sup> Edition, Academic Press, 2014.
8. Dr. Ovidiu Vermesan, Dr. Peter Friess, Internet of Things: Converging Technologies for Smart Environments and Integrated Ecosystems, River Publishers, 2013, ISBN: 978-87-92982-96-4 (EBook), ISBN: 978-87-92982-73-5 (Print)

## Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	12	12	20	08	08

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

## Course Outcome:

After learning the course, the student will be able:

1. Understand Internet and web connect of things and devices
2. Understand the vision of IoT from Smart City point of view
3. Create the prototype application of IoT.
4. Analyze state of the art ,Urbanized Utility Apps. and Transport Services like Smart parking etc.
5. Develop application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints.



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## List of Experiments:

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. Develop small application to sense car number plate NPR app.

## Major Equipment:

Sensors such as RTD, Thermister, LED , Lamps, Motors, Raspberry pi, Arduino, BeagleBone Black

## List of Open Source Software/learning website:

- <https://github.com/connectIOT/iottoolkit>
- <https://www.arduino.cc/>
- <http://www.zettajs.org/>
- Contiki (Open source IoT operating system)
- Arduino (open source IoT project)
- IoT Toolkit (smart object API gateway service reference implementation)
- Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and sensors)