GUJARAT TECHNOLOGICAL UNIVERSITY
Syllabus for Integrated MSc, 8th Semester
Branch: Computer Science
Subject Name: IOT Architecture and Protocols
Subject Code: 1380308

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE(E)	PA (M)	PA (V)	PA (I)	
3	0	2	4	70	30	30	20	150

Content:

Sr. No.	Content	Teaching Hours	Module Weightage (%)
1	**Introduction to IoT** • Overview of IoT**:** Definitions, history, and evolution of IoT • Key Components of IoT**:** Sensors, actuators, embedded systems, connectivity • IoT Applications**:** Smart cities, smart homes, healthcare, industrial IoT, etc. • Challenges in IoT**:** Scalability, security, data management	06	12
2	**IoT Architecture** • IoT Architecture Overview: Conceptual view, layers in IoT architecture (perception, network, and application layers) • Functional Blocks of IoT: Device, communication, services, management, and security blocks • Fog and Edge Computing: Role in IoT architecture, edge vs. cloud computing • IoT Reference Architectures: ITU-T, Cisco, Intel, etc. • Open IoT Architecture Models: OpenIoT, ARM's mbed IoT	12	30
3	**IoT Communication Protocols** • Introduction to IoT Protocols: Importance of protocols in communication • Application Layer Protocols: MQTT: Message Queuing Telemetry Transport, architecture, message types, CoAP: Constrained Application Protocol, features, HTTP/HTTPS: Traditional web protocols and their relevance in IoT • Transport Layer Protocols: TCP/IP: Role in IoT communication, UDP: Lightweight alternative to TCP • Network Layer Protocols: IPv6: IPv6 over Low-Power Wireless Personal Area Networks (6LoWPAN) • RPL: Routing Protocol for Low-Power and Lossy Networks • Link Layer Protocols: Bluetooth Low Energy (BLE): Overview, applications • Zigbee: Characteristics, applications • LoRaWAN: Long Range Wide Area Network, low-power, long-range communication	10	25

4	**Security in IoT Protocols** • Security Issues in IoT Architecture: Data confidentiality, integrity, authentication • Secure Communication Protocols: DTLS: Datagram Transport Layer Security, TLS: Transport Layer Security • End-to-End Encryption in IoT • IoT Device Authentication Mechanisms	06	13
5	**IoT Data Management and Standards** • IoT Data Management and Processing: Overview of data collection, analysis, and management in IoT • Big Data in IoT: Relationship and integration • IoT Standards and Alliances: Overview of major standardization bodies (IETF, IEEE, ITU, etc.) • Interoperability and Standards in IoT	06	10
6	**Case Studies and Future Trends** • Case Studies: Industry-specific IoT architectures (e.g., healthcare, manufacturing, agriculture) • Emerging IoT Protocols: Discussion on evolving standards and future trends (e.g., 5G, NB-IoT, LPWAN technologies) • IoT in the Cloud and Hybrid Architectures	04	10

Reference Books:

1. **Architecting the Internet of Things** by Dieter Uckelmann, Mark Harrison, Florian Michahelles
2. **Internet of Things: Principles and Paradigm** by Rajkumar Buyya, Amir Vahid Dastjerdi
3. **The Internet of Things: Enabling Technologies, Platforms, and Use Cases** by Pethuru Raj and Anupama C. Raman
4. **IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things** by David Hanes, Gonzalo Salgueiro, Patrick Grossetete
5. **Building the Internet of Things** by Maciej Kranz

Course Outcomes (COs):

1. Understand and explain the fundamental concepts and components of IoT systems and architectures.
2. Analyze and apply various IoT communication protocols across different layers, with a focus on application and transport layer protocols.
3. Design secure IoT architectures by incorporating appropriate security protocols to mitigate common vulnerabilities.
4. Demonstrate the ability to manage IoT data, including its collection, transmission, and analysis, by utilizing industry-standard protocols and tools.
5. Critically evaluate case studies of IoT implementations and identify emerging technologies and protocols shaping the future of IoT systems.