



GUJARAT TECHNOLOGICAL UNIVERSITY

Program Name: Master of Engineering

Level: PG

Branch: Internet of Things

Course / Subject Code : ME01062031

Course / Subject Name: IoT Gateway Design

w. e. f. Academic Year:	2024-25
Semester:	1 st Semester
Category of the Course:	PEC I

Prerequisite:	Basic knowledge of microprocessor, microcontroller, programming in assembly, C/C++, python, Knowledge of various wired and wireless technologies.
Rationale:	In any IoT applications, various communicating things: sensors/actuators are connected at larger as well as shorter distances with different wired and wireless technologies. Each technology has its protocol, data rate, latency and data format for communication. It is required to have a gateway to support such communicating things for a centralized data analysis. In future, the gateway will be compatible with existing technologies as well as cut-edging technologies. This course covers various aspects to develop IoT based gateways for current as well as future requirements.

Course Scheme:

Teaching Scheme			Total Credits	Assessment Pattern and Marks				Total Marks
L	T	PR	C	Theory		Practical		
				ESE (E)	PA(M)	ESE (V)	PA (I)	
03	00	02	04	70	30	30	20	150

Course Content:

Sr No	Course Content	No of Hours	% of Weightage
1	UNIT-I: IoT Potential: Definition Of The IoT, Industry And Manufacturing, Healthcare, Transportation and Logistics, Agricultural And Environment, Energy, Smart City, Military And Government, Spectrum, Architecture	04	10
2	UNIT-II: Non-IP Based WPAN: 802.15 Standards, Bluetooth, IEEE	04	10



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	802.15.4, Zigbee, Z-Wave		
3	UNIT-III: IP-Based WPAN and WLAN: TCP/IP, WPAN with IP – 6LoWPAN, IEEE 802.11 protocols and WLAN, WPAN with IP-Thread,	06	15
4	UNIT-IV: Long-Range Communication Systems and Protocols: Cellular Connectivity, 4G LTE – spectrum allocation and bands, topology and architecture, E-UTRAN protocol stacks, geographical areas, dataflow, handover, packet structure, 5G – frequency distribution, RAN architecture, core architecture, security and registration, ultra reliable low latency communication, fine grain time division duplexing & low latency HARQ, network slicing, energy considerations, LoRA and LoRAWAN – physical layer, MAC layer, topology, Sigfox – physical layer, MAC layer, protocol stack.	10	20
5	UNIT-V: Edge Computing: Edge purpose and definition, hardware architecture – processors, DRAM & volatile memory, storage and non-volatile memory, low-speed IO, high-speed IO.	08	20
6	UNIT-VI: Edge Routing and Networking: TCP/IP network functions at the edge, edge-level network security, software-defined networking	04	10
7	UNIT-VII: Edge to Cloud Protocols: MQTT,MQTT-SN, Constrained and Application Protocol	06	15

Reference Book:

1. Perry Lea, IoT and Edge Computing Architects, Second Edition, PACKT Birmingham, Mumbai.

Course Outcome:

After completion of the Course, Students will be able to:

No	Course Outcomes	RBT Level*
01	Understand various wired and wireless communicating technologies, edge	UN



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	computing	
02	Evaluate performance of various communication node topologies	AP
03	Apply various communicating technologies and edge computing	AP
04	Analyze any real-time existing various gateways for IoT applications	AN
05	Analyze of various communication technologies and edge computing	AN

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

Suggested Course Practical List:

At least 10-12 practical based on topics of the syllabus have to perform either in tools or in hardware kits.

List of Laboratory/Learning Resources Required:

- List of Hardware: IoT Builder
- List of Software: Python Programming
