ECE5056	Wireless Protocols for IoT	L	T	P	J	C
Pre-Requisite: NIL		2	0	0	4	3

Objectives:

To acquire the knowledge and technical skills for understanding and designing

- Network Protocol Stack for IoT
- Messaging and Transaction Protocols
- Interoperability and Middleware

Expected Outcome:

- Able to design a complete communication network protocol stack for IoT Applications

Student Learning Outcomes (SLO):	SLO: 2, 5, 6, 7, 11, 13, 17

Module 1	Wireless Technologies	4	hour	SLO: 6

Cellular and Mobile Networks, WPAN & Non-Wireless Technologies. IEEE 802.11 ac / ah (low power) – PHY and MAC. Evolving IoT Standards - 5G Internet and Mobile Clouds.

Module 2	PHY and MAC Layers of WPAN	4	hours	SLO: 6, 7

Internet of Things (IoT): Characteristics – Standards for Realization – Protocol Layered Stack. IEEE 802.15.4 / Zigbee – PHY and MAC for IoT. IEEE 802.15.6 – PHY and MAC for IoT. BLE, SIG and NFC.

Module 3	Network Layer Technologies	4	hours	SLO: 7, 14, 17

Layer3 connectivity: IPv6 and Mobile IPv6 Technologies for IoT – Ipv6 over Low-power WPAN (6LoWPAN) - RPL. 6LowPAN: Interconnecting objects with IPv6.

Module 4	Messaging and Transaction Protocols: CoAP and MQTT	4	hours	SLO: 5, 7, 17

Adding CoAP to - Sensors, Actuators and Controllers – Using CoAP in Controllers. Adding MQTT Support to – the Sensors, Actuators and Controller – AMPQ.

Module 5	XMPP and Gateway Protocols	4	hours	SLO: 5, 7, 17

Adding XMPP Support to the Thing, Sensors, and Actuators & Controller. Clayster Platform – Interfacing Devices using XMPP – Creating control applications. Creating Gateway Protocols – Clayster abstraction model – Understanding CoAP Gateway architectures.

Module 6	HTTP & UPnP Protocols	4	hours	SLO: 5, 7, 17

HTTP Basics – Adding HTTP Support to : Sensors, Actuators and Controllers – Creating Device Description Document – Creating Web and UPnP Interface – Implementing Still Image Service using Camera.

Module 7	Middleware Technologies	4	hours	SLO: 5, 6, 7, 17

Interoperability – Middleware for Smart Objects: Mobile-agents based smart objects – Service oriented Middleware for smart objects and Web Services.

Module 8	Contemporary Issues*	2	hours	2, 11

Recent Trends [LiFi, WiDi]

	Total Lecture:	30	hours	SLO: 2, 5, 6, 7, 11,17

Text Books:

1. Daniel Minoli "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", Wiley, 2015.
2. Asoke K. Talukder, Nuno M. Garcia, Jayateertha G. M., "Convergence Through All-IP

Networks", CRC Press, 2013.

3. Giancarlo Fortino, Paolo Trunfio, "Internet of Things Based on Smart Objects: Technology, Middleware and Applications", Springer Science & Business Media, 2014.

Reference Books:

1. Jonathan Rodriguez, "Fundamentals of 5G Mobile Networks", John Wiley, 2015.
2. Peter Waher, "Learning Internet of Things", Packt Publishing, 2015.

Typical Projects:	**SLO: 5, 6, 7, 13, 17**

1. Establishing the connectivity between embedded sensors and internet using SIM900A GSM-GPRS module
2. Zigbee based mine safety monitoring system
3. Simulation of IEEE802.15.4/Zigbee stack: PHY and MAC protocols
4. Simulate the NFC based smart shopping
5. Routing protocol for IPv6 enabled 6LoWPAN networks
6. Improving packet delivery performance of CoAP protocols in sensors
7. Low latency mobile messaging using MQTT
8. Home gateway using XMPP
9. Implementing still image using UPnP
10. Handling HTTP requests over XMPP

Approved by Academic Council No.:40 Date:18.03.2016