Course Code	18CSE345T	Course Name	INTERNET OF THINGS ARCHITECTURE AND PROTOCOLS	Course Category	E	Professional Elective	L	T	P	C
							3	0	0	3

Pre-requisite Courses	Nil	Co-requisite Courses	Nil	Progressive Courses	Nil
Course Offering Department	CSE	Data Book / Codes/Standards	Nil		

Course Learning Rationale (CLR):	The purpose of learning this course is to:	Learning
CLR-1 :	Understand Data and Knowledge Management and use of Devices in IoT Technology.	
CLR-2 :	Understand State of the Art – Architecture in IoT.	
CLR-3 :	To Understand the Architectural Overview of IoT	
CLR-4 :	Understand the IoT Reference Architecture and RealWorld Design Constraints	
CLR-5 :	To Understand the various IoT Protocols (Datalink, Network, Transport, Session, Service)	
CLR-6 :	Understand and apply IoT protocols appropriately	

Course Outcomes (CO):	At the end of this course, learners will be able to:	Blooms Level (1-6)	Program Outcomes (PO)														
			1	2	3	4	5	6	7	8	9	10	11	12	PSO - 1	PSO - 2	PSO – 3
			Engineering Knowledge	Problem Analysis	Design & Development	Analysis, Design, Research	Modern Tool Usage	Society & Culture	Environment & Sustainability	Ethics	Individual & Team Work	Communication	Project Mgt. & Finance	Life Long Learning			
CO-1 :	Interpret the vision of IoT architecture from a global context.	2	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO-2 :	Implement state of the art architecture in IoT.	3	3	-	2	-	-	-	-	-	-	-	-	-	-	-	-
CO-3 :	Compare and Contrast the use of Devices, Gateways and Data Management in IoT.	4	3	1	-	2	-	-	-	-	-	-	-	-	-	-	-
CO-4 :	Implement using the available resources and demonstrate quick to deployment protocols wherever applicable	2	3	-	3	2	-	-	-	-	-	-	-	-	-	-	-
CO-5 :	Apply the protocols and Techniques towards integration in relevant areas of IoT Product development	5	3	-	3	-	2	-	-	-	-	-	-	-	-	-	-
CO-6 :	Choose appropriate protocols for various layers (Datalink, Network, Transport, Session, Service)	2	3	2	-	2	-	-	-	-	-	-	-	-	-	-	-

Duration (hour)		9	9	9	9	9
S-1	SLO-1	M2M and IoT- Relevance and Transition	Data Management- Introduction	Introduction to RFID	Transport Layer Protocols - Introduction	Service Layer Protocols- Introduction
	SLO-2	Building an architecture	Managing M2M data: Data generation,	Introduction to NFC	TCP	oneM2M
S-2	SLO-1	Main design principles and needed capabilities	Data acquisition, Data validation	WSN(Large topic),	MPTCP	ETSI M2M
	SLO-2	IoT architecture outline	Data storage, Data processing	Narrow band IoT (NbIOT)	UDP	OMA
S-3	SLO-1	M2M and IoT Technology Fundamentals	Data remanence, Data analysis	WiFi	DCCP	BBF
	SLO-2	Devi ces and Gateways-Introduction	Data management,	PLC Communication Protocols: A comparison	SCT	Understanding Security and Interoperability
S-4	SLO-1	Basic Devices	Business processes in IoT	Popular radio protocols and its security drawbacks	TLS	Modes of attack: DoS, Getting Access, Guess, Man in Middle, Sniff, Post Scan
	SLO-2	Gateways	Everything as a Service (XaaS)	802.15.4 in depth	DTLS	Modes of attack: Web Crawl, Search Features and Wild Cards, Breaking Cipher

S-5	SLO-1	Advanced devices	M2M and IoT Analytics	Network Layer Protocols- Introduction	Session Layer-HTTP	Tools for achieving Security: VPN, X.509, Authentication,
	SLO-2	Need for networking	Knowledge Management	IPv4	CoAP	Tools for achieving Security: User names and Passwords, Message Brokers,
S-6	SLO-1	State of the art-ETSI M2M	Data Link Layer Protocols: PHY/MAC Layer:3GPP MTC	IPv6	Implementation demo of CoAP	Tools for achieving Security: Provisioning servers, Centralization versus decentralization,
	SLO-2	IoT Reference model-IoT Domain model	IEEE 802.11	6LoWPAN in depth	MQTT	The need for interoperability:
S-7	SLO-1	Information model	IEEE 802.15	6TiSCH	Implementation demo of MQTT	Combining Security and Interoperability
	SLO-2	Functional model	Wireless HART	ND	MQTT-SN	Need for Security in IoT Protocols – Introduction
S-8	SLO-1	Communication model	Z-Wave	DHCP	Implementation demo of MQTT-SN	Security in IoT Protocols :MAC 802.15.4
	SLO-2	Safety, privacy, trust, security model	Bluetooth, Bluetooth Low Energy	ICMP	XMPP	Security in IoT Protocols :6LoWPAN,
S-9	SLO-1	Introduction to Protocols- Physical, Data Link	Zigbee, Zigbee Smart Energy	RPL	AMQP	Security in IoT Protocols :RPL
	SLO-2	Introduction to Protocols- Network, Transport, Application	DASH7	CORPL, CARP	Introduction to Contiki- Practical demo	Security in IoT Protocols: Application Layer

Learning Resources	1. Uckelmann, D., Harrison, M., & Michahelles, F. (Eds.). Architecting the Internet of Things.doi:10.1007/978-3-642-19157-2 , 2011 2. IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things by Rob Barton, Gonzalo Salgueiro, David Hanes, Publisher: Cisco Press, Release Date: June 2017, ISBN: 9780134307091 (https://www.oreilly.com/library/view/iot-fundamentals-networking/9780134307091/) 3. Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, StamatisKarnouskos, David Boyle, "From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence", 1st Edition, Academic Press, 2014 5. Peter Waher, "Learning Internet of Things", PACKT publishing, BIRMINGHAM – MUMBAI 6. Daniel Minoli, "Building the Internet of Things with IPv6 and MIPv6: The Evolving World of M2M Communications", ISBN: 978-1-118-47347-4, Willy Publications

Learning Assessment

	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (15%)		CLA – 3 (15%)		CLA – 4 (10%)			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	-	15%	-	15%	-	-	-	15%	-
Level 2	Understand	20%	-	25%	-	25%	-	-	-	25%	-
Level 3	Apply	45%	-	40%	-	40%	-	40%	-	30%	-
Level 4	Analyze	15%	-	20%	-	20%	-	30%	-	20%	-
Level 5	Evaluate	-	-	-	-	-	-	30%	-	10%	-
Level 6	Create	-	-	-	-	-	-	-	-	-	-
	Total	100 %		100 %		100 %		100 %		100%	

CLA – 4 can be from any combination of these: Assignments, Seminars, Tech Talks, Mini-Projects, Case-Studies, Self-Study, MOOCs, Certifications, Conf. Paper etc.,

Course Designers

Experts from Industry	Experts from Higher Technical Institutions	Internal Experts
Mr. Vinay Solanki, Head IoT, Lenovo (APAC & MEA)	Dr.Zayaraj, Professor / CSE, PEC, Pondicherry	Dr. S.Babu, SRMIST
Dr. Paventhan Arumugum, Director (R&D), ERNET India	**Dr.Vijalakshmi Associate Professor / CSE, PEC, Pondicherry**	Dr.Kayalvizhi Jayavel, SRMIST
Shiv Kumar Ganesh, Full Stack Developer, Altimetrik	**Dr.P.Yogesh, Professor/IT, Anna University, Chennai.**	Mr.V.Haribaabu, SRMIST