Course Code	*PCA20D09J*	Course Name	INTERNET OF THINGS (IoT)	Course Category	D	*Discipline Elective Course*	L	T	P	C
							3	0	2	4

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

Course Learning Rationale (CLR):	The purpose of learning this course is to,	Learning

CLR-1 :	Demonstrate the design, communication model and enabling technologies for IoT.
CLR-2 :	Explore the system management and domain for various applications of IoT
CLR-3 :	Categorize the various protocols that are used for developing IoT applications.
CLR-4 :	Deploy an IoT application and connect to the cloud.
CLR-5 :	Develop IoT application for real time scenario

Course Learning Outcomes (CLO):	At the end of this course, learners will be able to:	Level of Thinking (Bloom)	Expected Proficiency (%)	Expected Attainment (%)
CLO-1 :	Apply the knowledge/understanding of mathematics, science, to the solution of complex problems applicable to the discipline	3	80	70
CLO-2 :	Design, implement, and evaluate a computer-based system, process, component, or program to meet desired solutions that meet the specified needs with suitable concern for the public health and safety, and the cultural, societal, and environmental considerations.	3	85	75
CLO-3 :	Create, select, and apply applicable techniques, resources, and modern engineering and IT tools to complex engineering activities with an understanding of the limitations.	3	75	70
CLO-4 :	Function successfully as an individual, and as a member or leader in assorted teams, and in multidisciplinary settings.	3	85	80
CLO-5 :	Prove knowledge and understanding of the engineering and management principles and apply the same to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	3	85	75

Program Learning Outcomes (PLO)

	1 Disciplinary Knowledge	2 Critical Thinking	3 Problem Solving	4 Analytical Reasoning	5 Research Skills	6 Team Work	7 Scientific Reasoning	8 Reflective Thinking	9 Self-Directed Learning	10 Multicultural Competence	11 Ethical Reasoning	12 Community Engagement	13 ICT Skills	14 Leadership Skills	15 Life Long Learning
CLO-1 :	L	H	-	H	L	-	-	-	L	L	-	H	-	-	-
CLO-2 :	M	H	L	M	L	-	-	-	M	L	-	H	-	-	-
CLO-3 :	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-4 :	M	H	M	H	L	-	-	-	M	L	-	H	-	-	-
CLO-5 :	H	H	M	H	L	-	-	-	M	L	-	H	-	-	-

Duration (hour)		15	15	15	15	15
S-1	SLO-1	*Introduction*	*Introduction*	*Introduction about Iot protocols*	*IoT Platforms Design Methodology*	*Introduction about RESTful API*

	SLO-2	*Definition& Characteristics of IoT*	*Application of IoT*	*Infrastructure , 6LowPAN, Architecture of 6LowPAN*	*Purpose & Requirements, process model specification, domain model specification*	*Designing a RESTful Web API*
S-2	SLO-1	*Physical design of IoT*	*Home Automation*	*Ipv6, Architecture of Ipv6*	*Information model specifications, service specifications, Iot level specifications*	*Amazon Web Services*
	SLO-2	*Things in IoT,*	*Cities,Industry, Health & Lifestyle*	*Comms / Transport*	*Functional view specifications, operational view specifications.*	*Amazon Web Services for IoT*
S-3	SLO-1	*IoT protocols*	*Discuss Health*	*Wifi,*	*Device & component Integration, Application development*	*Creating a ID in Amazon*
	SLO-2	*logical Design of IoT*	*Lifestyle problem*	*Bluetooth,*	*IoT System for Weather Monitoring, Purpose & Requirements, process model specification, domain model specification, Information model specifications, service specifications, Iot level specifications*	*EC2, Implementation of EC2, Autoscaling*
S 4 – S 5	**SLO-1**	**Lab 1: Define and Explain Eclipse IoT Project.**	**Lab 4: Sketch the architecture of IoT**	**Lab 6: Describe gateway as a service deployment in Iot toolkit**	**Lab 10: Give overview of Zetta.**	**Lab 13: Smart Irrigation System**
S-6	SLO-1	*IoT Functional Blocks* ,IoT Communication Model	*M2M*	*mDNS , Discovery, Physical Web*	Functional view specifications, operational view specifications.	Implementation of Autoscaling
	SLO-2	and IoT Communication APIs	*Architecture of M2M*	*DNS-SD*	Device & component Integration, Application development	S3
S-7	SLO-1	IoT Enabling Technologies	SDN, Architecture of SDN	*Data Protocols*	IoT System for Agriculture	Implementation of S3
	SLO-2	Wireless Sensor Networks, Cloud Computing, Big Data Analytics	NFV for IOT, Architecture of NFV	MQTT, Examples of MQTT, Difference between MQTT and HTTP	Purpose & Requirements, process model specification, domain model specification	RDS
S-8	SLO-1	Communication Protocols, Embedded Systems	IoT System Management	CoAP	Information model specifications, service specifications, Iot level specifications	Implementation of RDS
	SLO-2	IoT Levels and Deployment Templates, Levels 0	Advantages of IoT system management, Need for IoT Systems Management	AMQP	Functional view specifications, operational view specifications. Device & component Integration, Application development	DynamoDB, Implementation of DynamoDB, Kinesis
S-9-S 10	**SLO-1**	**Lab 2: List and summarize few Eclipse IoT Projects.**	**Lab 4:Demonstrate a smart object API gateway service**	**Lab 7:Explain application framework and embedded software agents for IoT toolkit**	**Lab 11: Home Automation – Level 0**	**Lab 14: Weather Reporting Systems**

			reference implementation in IoT toolkit			**Lab 15: Air Pollution Monitoring System**
S-11	SLO-1	Levels 1, Levels 2	Disadvantages of IoT system management	Types of CoAP	Introduction to Cloud Storage Models, Arduino	Implementation of Kinesis
	SLO-2	Levels 3	Simple Network Management Protocol	Request and Response methods	Rasberry pi, Explanation of raspberry pi pin diagram	Case studies – Environment IoT systems for weather Reporting Bot Air Pollution Monitoring System Forest Fire Detection Case studies - IoT system for Energy Smart grid Renewable Energy Systems
S-12	SLO-1	Level 4	Limitations of SNMP	Pros and Cons of CoAP	Introduction to Cloud StorageCommunication APIs	
S-13	SLO-1	Level 5, IOT Applications	Network Operator, Requirements	Semantic, JSON- LD	Python Web Application Framework, Django Architecture Design of Weather Monitoring using Django, Starting Development with Django Toolkit	
S-14-S 15	**SLO-1**	**Lab 3:Smart Lighting**	**Lab 5: Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.**	**Lab 8: Explain working of Raspberry Pi. Lab 9: Connect Rasberry Pi with your existing system components**	**Lab 12: Home Automation – Level 4**	

Learning Resources	1. ArshdeepBahga and Vijay Madisetti, "Internet of Things - A Hands-on Approach", Universities Press, 2015.(Unit I – Unit V) 2. Dieter Uckelmann et.al, "Architecting the Internet of Things", Springer, 2011. 3. CunoPfister, "Getting Started with the Internet of Things", O'Reilly, 2011.	4. Adrian McEwen, Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014. 5. HonboZhou , "The Internet of Things in the Cloud: A Middleware Perspective ", CRC Press , 2012. 6. Olivier Hersent, David Boswarthick, Omar Elloumi, "The Internet of Things – Key applications and Protocols", Wiley, 2012.

Learning Assessment											
Level	Bloom's Level of Thinking	Continuous Learning Assessment (50% weightage)								Final Examination (50% weightage)	
		CLA – 1 (10%)		CLA – 2 (10%)		CLA – 3 (20%)		CLA – 4 (10%) #			
		Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice	Theory	Practice
Level 1	Remember	20%	20%	15%	15%	15%	15%	15%	15%	15%	15%
	Understand										
Level 2	Apply	20%	20%	20%	20%	20%	20%	20%	20%	20%	20%
	Analyze										
Level 3	Evaluate	10%	10%	15%	15%	15%	15%	15%	15%	15%	15%
	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.G.Muruganandam, Group Project Manager, HCL Technologies, Chennai	Dr.S.Gopinathan, Professor, University of Madras, Chennai	*Dr.S.Umarani, SRMIST*
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