Course Code	UCA20D09J	Course Name	INTERNET OF THINGS	Course Category	D	Discipline Specific Elective Course	L	T	P	C
							4	0	4	6

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.	1
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	2	3	4	5	6	7	8	9	10	11	12	13	14	15
	Fundamental Knowledge	Application of Concepts	Link with Related Disciplines	Procedural Knowledge	Skills in Specialization	Ability to Utilize Knowledge	Skills in Modeling	Analyze, Interpret Data	Investigative Skills	Problem Solving Skills	Communication Skills	Analytical Skills	ICT Skills	Professional Behavior	Life Long Learning
CLO-1	L	H	-	H	L	-	-	H	L	L	-	H	-	-	H
CLO-2	M	H	L	M	L	-	-	M	M	L	-	H	-	-	M
CLO-3	M	H	M	H	L	-	-	H	M	L	-	H	-	-	H
CLO-4	M	H	M	H	L	-	-	H	M	L	-	H	-	-	H
CLO-5	H	H	M	H	L	-	-	H	M	L	-	H	-	-	H

Duration (hour)		24	24	24	24	24
S-1	SLO-1	Introduction	Introduction	IoT Platforms Design Methodology	IoT Platforms	Introduction about RESTful API
	SLO-2	Definition& Characteristics of IoT	Communication Models in IoT	Introduction	IoT Logical Design with Python	Designing a RESTful Web API

S-2	SLO-1	Physical design of IoT	Device to Device Model	Purpose & Requirements, process model specification, domain model specification	Python Data types and Data Structures	Amazon Web Services
	SLO-2	Things in IoT	Device to Cloud Model	Information model specifications, service specifications, Iot level specifications	Control Flow statements	Amazon Web Services for IoT
S-3	SLO-1	IoT protocols	Device to Gateway Model	Functional view specifications, operational view specifications.	Classes	Creating a ID in Amazon
	SLO-2	IoT protocols	Back End Data Sharing Model	Device & component Integration, Application development	Python Packages for IoT	EC2
S-4	SLO-1	logical Design of IoT	M2M	IoT System for Weather Monitoring	JSON	Implementation of EC2
	SLO-2	IoT Functional Blocks	Differences between IoT and M2M	Purpose & Requirements, process model specification, domain model specification	XML	Autoscaling
S 5-8	SLO-1	Lab 8: Explain working of Raspberry Pi.	Lab 4:Demonstrate a smart object API gateway service reference implementation in IoT toolkit	Lab 7:Explain application framework and embedded software agents for IoT toolkit.	Lab 10:Reading Data from Internet using sensor	Lab 13: Smart Irrigation System
	SLO-2					
S-9	SLO-1	IoT Levels and Deployment Templates	M2M in IoT	Information model specifications, service specifications, Iot level specifications	HTTPLib	Implementation of Autoscaling
	SLO-2	Levels 0	Architecture of M2M	Functional view specifications, operational view specifications.	URLLib	S3
S-10	SLO-1	Levels 1	Software-DefinedNetworking (SDN) SDN	Device & component Integration, Application development	SMTPLib	Implementation of S3
	SLO-2	Levels 2	Architecture of SDN	IoT System for Agriculture	IoT Physical Devices	RDS
S-11	SLO-1	Levels 3	Network Function Virtualization(NFV)	Purpose & Requirements, process model specification, domain model specification	What is an IoT Device?	Implementation of RDS
	SLO-2	Level 4	Architecture of NFV	Information model specifications, service specifications, Iot level specifications	Basic Building Blocks of IoT device	DynamoDB
S-12	SLO-1	Level 5	NFV for IOT	Functional view specifications, operational view specifications.	Example Device: Raspberry Pi	Implementation of DynamoDB
	SLO-2	IoT Deployment Challenges	IoT System Management	Functional view specifications, operational view specifications	About the board	Kinesis
S 13-16	SLO-1	Lab 2: Controlling LED with Raspberry Pi	Lab 5: Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.	Introduction to Cloud Storage Models	Lab 11: Home Automation	Lab 14: Health care system
	SLO-2					
S-17	SLO-1	Domain Specific IoT	Advantages of IoT system management	Stages of IoT Architecture	Raspberry Pi Interfaces	Implementation of Kinesis
	SLO-2	Home	Need for IoT Systems Management	Sensors/Actuators	Serial	Case studies – Environment
S-18	SLO-1	Cities	Disadvantages of IoT system management	Devices	SPI	IoT systems for weather Reporting Bot

	SLO-2	Environment	NETCONF	Gateway	Serial	Air Pollution Monitoring System
S-19	SLO-1	Energy systems	YANG	Cloud	Introduction to Arduino	Forest Fire Detection
	SLO-2	Industry	IoT Systems Management with NETCONF-YANG	IoT Security and Interoperability	IoT hardware	Case studies - IoT system for Energy
S-20	SLO-1	Agriculture	IoT device Management with NETCONF-YANG	Risks and Attacks	Microprocessors & Microcontrollers	Smart grid
	SLO-2	Health and Lifestyle	NETOPEER	Tools for Security and Interoperability	Sensors	Renewable Energy Systems
S 21-24	SLO-1	Lab 3: Interfacing Light Sensor with Raspberry pi	Lab 6: Describe gateway as a service deployment in Iot toolkit	Lab 9: Arduino with ESP8266 explanation	Lab 12: Remote Surveillance system	Lab 15:Air Pollution Monitoring System
	SLO-2					

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

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, Short 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*	*Mrs. Anita Jasmine, SRMIST*
Mr.M. Hemachandar, Tech Lead, Wipro Limited, Chennai		*Mrs. M. Ramla. SRMIST*