Course Code	PCS21E05J	Course Name	INTERNET OF THINGS		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 Science	Data Book / Codes/Standards		Nil

Course Learning Rationale (CLR):	The purpose of learning this course is to:
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
CLR-6 :	Implementation of IoT application for real world problems

Course Learning Outcomes (CLO): At the end of this course, learners will be able to:

Learning: 1 = Level of Thinking (Bloom), 2 = Expected Proficiency (%), 3 = Expected Attainment (%)

Program Learning Outcomes (PLO): 1 Fundamental Knowledge, 2 Application of Concepts, 3 Link with Related Disciplines, 4 Procedural Knowledge, 5 Skills in Specialization, 6 Ability to Utilize Knowledge, 7 Skills in Modeling, 8 Analyze, Interpret Data, 9 Investigative Skills, 10 Problem Solving Skills, 11 Communication Skills, 12 Analytical Skills, 13 PSO 1, 14 PSO 2, 15 PSO 3

CLO	Description	1	2	3	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
CLO-1 :	Apply the knowledge/understanding of mathematics, science, to the solution of complex problems applicable to the discipline	3	80	70	L	H	-	H	L	-	-	-					-	-	-
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	M	H	L	M	L	-	-	-					-	-	-
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	M	H	M	H	L	-	-	-					-	-	-
CLO-4 :	Function successfully as an individual, and as a member or leader in assorted teams, and in multidisciplinary settings.	3	85	80	M	H	M	H	L	-	-	-					-	-	-
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	H	H	M	H	L	-	-	-					-	-	-
CLO-6 :	Apprehend the importance of technology with the current scenario	3	80	70	L	H	-	H	L	-	-	-					-	-	-

Duration (Hour)			15	15	15	15	15
S-1	SLO-1	Introduction	IoT Levels and Deployment Templates	IoT System Management	MQTT, Difference between MQTT and HTTP	Process, Domain level specifications
	SLO-2	Definition& Characteristics of IoT	level 0 , level 1, level 2	Advantages of IoT system management	CoAP, Types of CoAP	Information, service, IoT level specifications
S-2	SLO-1	Physical design of IoT, Things in IoT	Level 3, level 4, level 5	Disadvantages of IoT system management	Request and Response methods, Pros and Cons of CoAP	Functional view specifications, operational view specifications
	SLO-2	IoT protocols	IOT Applications	Need of IoT system management	AMQP, Semantic, JSON-LD	Device & component Integration, Application development
S-3	SLO-1	Logical Design of IoT	Home Automation	Simple Network Management Protocol	Sensor network	IoT System for Weather Monitoring

Duration (Hour)		15	15	15	15	15
	SLO-2	And its application	IOT enabled devices	Analysis of network management	Sensor network devices	real-time weather monitoring
S4-5	SLO-1	Laboratory 1: Define and Explain Eclipse IoT Project	Laboratory 4: Demonstrate a smart object API gateway service reference implementation in IoT toolkit	Laboratory 7: Explain the application framework and embedded software agents for IoT toolkit.	Laboratory 10: Give overview of Zetta.	Laboratory 13: Smart Irrigation System
	SLO-2					
S-6	SLO-1	IoT Functional Blocks	Discuss Home automation problems	Introduction about IOT protocols	Man to Machine communications	Purpose
	SLO-2	IoT Blocks	Discuss Real-time problems	Brief about IOT protocols	M2M functionalities	Requirements
S-7	SLO-1	IoT Communication Model	Discuss cities problem	Architecture of 6LowPAN	Wireless networks	Process
	SLO-2	Interopearability in IoT	Discuss Framework problems	Embedded Systems	Comparisons of wired and wireless networks	Domain level specifications
S8	SLO-1	IoT Communication APIs	Discuss Industry problem	Network operator	Interoperability in IoT	Information, service, IOT level specifications
	SLO-2	Sensors	Discuss mapping proxy	Architecture of IPv6	Introduction to Arduino	Functional view specifications,
S9-10	SLO-1	Laboratory 2: List and summarize few Eclipse IoT Projects.	Laboratory 5: Write and explain working of an HTTP- to-CoAP semantic mapping proxy in IoT toolkit.	Laboratory 8: Explain working of Raspberry Pi.	Laboratory 11: Home Automation – Level 0	Laboratory 14: Weather Reporting Systems
	SLO-2					
S-11	SLO-1	Sensor types	Discuss Health & Lifestyle problem	Wi-Fi	Arduino programming	operational view specifications
	SLO-2	Actuators and its types	Architecture of M2M	Bluetooth	Integration of sensors and actuators	Device & component Integration, Application development
S-12	SLO-1	Communication Protocols	Architecture of SDN	Physical Web	IoT Platforms	Introduction to Cloud Storage Models
	SLO-2			mDNS	Design Methodology	
S-13	SLO-1	Embedded Systems	NFV for IoT	DNS-SD	Purpose	Amazon Web Services for IoT
	SLO-2	Applications of embedded systems	Architecture of NFV	Data Protocols	Requirements	Discuss real-time example
S14-S15	SLO-1	Laboratory 3: Sketch the architecture of IoT Toolkit	Laboratory 6: Describe gateway as a service deployment in IoT toolkit	Laboratory 9: Connect Raspberry Pi with your existing system components	Laboratory 12: Home Automation – Level 4	Laboratory 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, 2011. | 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

Bloom's Level of Thinking		Continous 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**
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