Paper Code: ARI 202	L	T/P	Credits
Subject: Internet of Things	3	-	3

Marking Scheme

Teachers Continuous Evaluation: As per university examination norms from time to time.

End Term Theory Examination: As per university examination norms from time to time.

INSTRUCTIONS TO PAPER SETTERS: Maximum Marks: As per University Norms

- There should be 9 questions in the end term examination question paper
- Question No. 1 should be compulsory and cover the entire syllabus. This question should have objective or short answer type questions. It should be of 15 marks.
- Apart from Question No. 1, rest of the paper shall consist of four units as per the syllabus. Every unit should have two questions. However, student may be asked to attempt only 1 question from each unit. Each question should be 15 marks.
- The questions are to be framed keeping in view the learning outcomes of course/paper. The standard/ level of the questions to be asked should be at the level of the prescribed textbooks.
- The requirement of (scientific) calculators/ log-tables/ data-tables may be specified if required

Course Outcomes:

CO1:	Ability of students to implement the basic knowledge of Internet of things and protocols.**[K1, K2, K3]**
CO2:	Ability of students to implement knowledge of IoT in some of the application areas where IoT can be applied and learn about the middleware for IoT.**[K1, K2]**
CO3:	Ability of students to utilize the concepts of IoT architecture, IoT reference model and overview of IoTivity stack architecture.**[K1, K2, K3]**
CO4:	Ability of students to utilize and implement solid theoretical foundation of the IoT Platform and System Design.**[K1, K2]**

Course Outcomes (CO)

CO/PO	PO01	PO02	PO03	PO04	PO05	PO06	PO07	PO08	PO09	PO10	PO11	PO12
CO1	3	3	3	3	2	2	1	1	3	2	2	3
CO2	3	3	3	3	2	2	1	1	3	2	2	3
CO3	3	3	3	3	2	2	1	1	3	2	2	3
CO4	3	3	3	3	2	2	1	1	3	2	2	3

Course Content	**No of lectures**
Unit I **Introduction to IoT:** Meaning of IoT, Importance of IoT, Elements of an IoT ecosystem, Technology drivers, Business drivers, Trends and implications, Overview of Governance, Privacy and Security Issues. Technologies involved in IoT development, Internet web and Networking technologies, Infrastructure, Overview of IoT supported Hardware platforms	[8]
Unit II **IoT protocols:** Protocol Standardization for IoT, Efforts, M2M and WSN Protocols, Role of M2M in IoT, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, SCADA and RFID Protocols, Issues with IoT Standardization, Unified Data Standards Protocols, IEEE802.15.4–BACNet Protocol, Modbus, KNX, Zigbee, Network layer, APS layer – Security	[9]
Unit III **IoT Architecture:** IoT Open-source architecture (OIC), OIC Architecture & Design principles	[10]

IoT reference Model and Architecture: Functional View, Information View, Deployment and Operational View, IoT Devices and deployment models, IoTivity: An Open source IoT stack **Overview:** IoTivity stack architecture, Resource model and Abstraction	
Unit IV **Web of things:** Web of Things versus Internet of Things, Two Pillars of the Web, Architecture Standardization for WoT, Platform Middleware for WoT, Unified Multitier **WoT Architecture:** WoT Portals and Business Intelligence **IoT applications** Applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications. Study of existing IoT platforms /middleware, IoT- A, Hydra etc.	[9]

Textbooks:

[T1] Zhou, H. (2012). *The internet of things in the cloud*. Boca Raton, FL: CRC press.

[T2] Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds) (2011) *Architecting the Internet of Things*, Springer.

[T3] Easley, D., & Kleinberg, J. (2010). *Networks, crowds, and markets: Reasoning about a highly connected world*. Cambridge university press.

[T4] Hersent, O., Boswarthick, D., & Elloumi, O. (2011). *The internet of things: Key applications and protocols*. John Wiley & Sons.

References Books:

[R1] Bahga, A., & Madisetti, V. (2014). *Internet of Things: A hands-on approach*. Vpt.Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications, 2013

[R2] Pfister, C. (2011). *Getting started with the Internet of things: connecting sensors and microcontrollers to the cloud*." O'Reilly Media, Inc.".