Kadi Sarva Vishwavidyalaya

Faculty of Engineering and Technology

First Year Master of Engineering (Computer Engineering)

In Effect from Academic Year 2017-18

Subject Code: MECE204-N-A	**Subject Title: INTERNET OF THINGS**

Teaching scheme				**Total Credit**	**Evaluation Scheme**					
L	**T**	**P**	**Total**		**Theory**		**Mid Sem Exam**	**CIA**	**Pract.**	**Total**
Hrs	**Hrs**	**Hrs**	**Hrs**		**Hrs**	**Marks**	**Marks**	**Marks**	**Marks**	**Marks**
04	**00**	**02**	**06**	**05**	**03**	**70**	**30**	**20**	**30**	**150**

LEARNING OBJECTIVES:

The objective of this course is

- Vision and Introduction to IoT
- Understand state of the art – IoT Architecture
- To understand about IoT and Cloud Computing collaboration
- To design IoT based system for smart cities
- Understand about various applications of IoT
- To understand about Internet of Things Vehicles

OUTLINE OF THE COURSE:

Unit No	**Topics**	**Hours**
1	Internet of Things: An Overview	10
2	Web Infrastructure for Managing IoT Resources	12
3	Internet of Things Enablers and Solutions	06
4	Internet of Things Data and Knowledge Management	08
5	IoT Reliability, Security and Privacy	14
6	Internet of Things Applications	14

Total hours (Theory): 64
Total hours (Practical): 32
Total hours: 96

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DETAILED SYLLABUS:

Sr. No	Topic	Lecture Hours	Weight age (%)
1	**Internet of Things: An Overview** • Introduction and IoT definition evolution • IoT Architectures • IoT Resource Management, Data Management and Analytics • IoT Communication Protocols • Security, Privacy and Identity Management • Internet of Things Applications	10	16
2	**Web Infrastructure for Managing IoT Resources** • Introduction • OpenIoT Architecture for IoT/Cloud Convergence • Scheduling Process and IoT Service Lifecycle • Scheduling and Resource Management • Device/Cloud Collaboration Framework • Applications of Device/Cloud Collaboration • Future Research Directions	12	19
3	**Internet of Things Enablers and Solutions:** • Message Passing in Devices • Survey of IoT Programming Frameworks • Virtualization and Real Time • IoT Architecture for Selected Use Cases • Future Research Directions	06	09
4	**Internet of Things Data and Knowledge Management:** • Stream Processing in the System Architecture of IoT • A Foundation of Stream Processing in IoT • Continuous Logic Processing System • Stream Processing Challenges and Future Directions • Future Research Directions	12	08
5	**Internet of Things Reliability, Security and Privacy:** • IoT Reference Model • IoT Security Requirements • IoT Security Overview • Security Framework for IoT • Secure Data Aggregation • IoT Characteristics and Reliability Issues • IoT Governance and Issues • Future Research Directions	14	22

6	**Internet of Things Applications:** • Applied IoT Basics and Scenario • Applied IoT Architecture Overview • Sensors and Gateway • IOV Network Architecture • IOV Characteristics and Challenges • MAC Protocols and Standards • Routing Protocols • Cloud based Smart Facilities Management and Architecture • Middleware Services • Resource Management Techniques for WSN and Supporting Data Analytics • Case Study: Management of Sensor Based Bridges and Smart Machinery	14	22
	Total	64	100

INSTRUCTIONAL METHOD AND PEDAGOGY (Continuous Internal Assessment (CIA) Scheme)

- At the start of course, the course delivery pattern, prerequisite of the subject will be discussed.
- Lectures will be conducted with the aid of multi-media projector, black board, OHP etc.
- Attendance is compulsory in lecture and laboratory which carries 10 marks in overall evaluation.
- One internal exam will be conducted as a part of internal theory evaluation.
- Assignments based on the course content will be given to the students for each unit and will be evaluated at regular interval evaluation.
- Surprise tests/Quizzes/Seminar/tutorial will be conducted having a share of five marks in the overall internal evaluation.
- The course includes a laboratory, where students have an opportunity to build an appreciation for the concepts being taught in lectures.
- Experiments shall be performed in the laboratory related to course contents.

STUDENTS LEARNING OUTCOMES:

On successful completion of the course, the student will:

- Students able to understand basics of internet and internet of things.
- Explain the detail working principles of internet of things.
- Understand challenges and opportunities of wireless and mobile networks for internet of things.
- Be able to understand various sensors which are really useful to develop the various internet of things applications.
- Understand about various internet of things protocols for various user's perspective applications.
- Building the state of art architecture in internet of things and also be able to learn various devices, gateways and data management in internet of things.
- Be able to understand various requirements (like protocols and tools) for design internet of things applications.

- Students will be given the opportunity to apply these technologies to tackle the scenario of their choice in teams of two, using an experimental platform for implementing prototypes and testing them as running applications.
- Become familiar with the various transport layer protocol, applications layer protocol and various sensors which are very important to design internet of things applications.
- Addresses the main concepts and research challenges of the IoT paradigm.
- Be able to learn security and privacy in IoT environments.
- Familiar with the Data Management Techniques, Architectures and various key enablers to enable practical IoT systems.

REFERENCE BOOKS:

1. Internet of Things Principles and Paradigms, Edited By Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufmann, ELSEVIER
2. Fundamentals of Wireless Sensors Networks Theory and Practice, Waltenegus Dargie and Christian Poellabauer, WILEY Series
3. Rethinking the Internet of Things A Scalable approach to connecting everything, Francis daCosta, Apress Open
4. Arduino Cookbook, Michael Margolis, O'REILLY
5. Internet of Things - From Research and Innovation to Market Deployment, Edited By Ovidiu Vermesan and Peter Friess, River Publishers

LIST OF PRACTICALS:

Sr. No	Name of Experiment
1	Study of Arduino development board
2	Study of IoT protocols MQTT and CoAP
3	Study of ESP8266 and NodeMCU development board
4	Blink LED at a fixed interval with - Arduino, NodeMCU
5	Interface analog sensor (temperature sensor LM35) with - Arduino and test simulation in Proteus, NodeMCU
6	Configure ESP8266/NodeMCU in Station and in Access Point modes
7	Develop offline Webserver to control GPIO: Demonstrate offline webserver using HTML webpage which can be accessed from web browser and through which LED can be toggled
8	Using IoT protocol: Demonstrate simple publish subscribe mechanism of MQTT protocol using MQTT protocol
9	Using IoT with NodeRED and Raspberry Pi: Implement a visitor counter which counts the visitors using motion (PIR) sensor and publishes the counts to an android phone using MQTT protocol. Interface PIR sensor with Raspberry Pi and implement the logic using Node RED.
10	Survey Paper