COURSE TITLE	**FUNDAMENTALS OF IOT & SCADA SECURITY**
COURSE CODE	**01CC0504**
COURSE CREDITS	**3**

Objective:

1 To introduce the fundamental concepts, components, and evolution of the Internet of Things (IoT). To explore the integration of IoT with cloud platforms, especially Microsoft Azure, and its services. To understand the security aspects of IoT applications across various cloud technologies and architectures. To examine the role and security of SCADA systems and emerging technologies like AI in cloud-integrated IoT environments.

Course Outcomes: After completion of this course, student will be able to:

1 Explain the basic concepts of IoT and various IoT platforms.

2 Apply IoT concepts using Microsoft Azure Cloud services.

3 Develop IoT-based applications integrated with Microsoft Azure Cloud services.

4 Analyze security concepts in IoT environments using Microsoft Azure Cloud services.

5 Evaluate the integration of Microsoft Azure Cloud with emerging technologies such as AI/ML in IoT and SCADA systems.

Pre-requisite of course: Basic understanding of Computer Networks (TCP/IP, HTTP, MQTT basics), Fundamental knowledge of Programming (C/Python basics preferred), Basic electronics concepts (sensors, microcontrollers), Familiarity with Operating Systems and Cloud fundamentals, Introductory knowledge of Cybersecurity concepts (CIA triad, threats)

Teaching and Examination Scheme

Theory Hours	Tutorial Hours	Practical Hours	ESE	IA	CSE	Viva	Term Work
2	0	2	50	30	20	25	25

Contents : Unit	Topics	Contact Hours
1	**INTRODUCTION OF IOT** Definition of IOT, History of IOT, Need of IOT - Benefits of IOT, IOT Classes & Stages, Use of IOT, Types of IOT Devices, RFID, Fingerprints, Eye Retina , Multiple Authentication,Types of Sensors & It's use, Introduction of Arduino & Raspberry Pi, Arduino Cases in IOT, Raspberry Pi in IOT ,Use of Arduino & Raspberry Pi in IOT.	6

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Contents : Unit	Topics	Contact Hours
2	**IOT WITH CLOUD** Introduction of Microsoft Azure :What is it's Need, Benefits of Microsoft Azure Cloud , Services of Microsoft Azure with IOT, Services that can be connected in IOT, Introduction to Azure IOT Hub , Use of Azure IOT Hub , Services that can be connected, Azure IOT Edge , Description of Microsoft Azure Cloud Services in IOT, 2.10.IOT Hub Device Provisioning Service (DPS), Case study for Smart Parking Management System.	7
3	**IOT SECURITY WITH VARIOUS CLOUD PLATFORMS** Serverless Computing, Advantages of Serverless Computing,, Introduction to Security, What is Kubernetes, Advantages & Disadvantages of Kubernetes, Architecture of Kubernetes, Correlated Kubernetes, Docker & Container, Difference between Kubernetes vs Docker vs Container, Case study using Microsoft Azure Cloud using IOT Hub & IOT Edge for Smart Garbage Management System.	7
4	**INTRODUCTION OF SCADA** Introduction to SCADA, Use of SCADA, Advantages of SCADA, Disadvantages of SCADA in Azure, Framework for SCADA,, Steps for SCADA System Installation, Monitoring - RBAC - Data Leak - Identity & Access Management - Training.	6
5	**SCADA SECURITY WITH CLOUD TRENDING TECHNOLOGIES** Enabled Technologies in IOT Devices, Role of AI in Microsoft Azure Cloud, Benefits of AI in Microsoft Cloud, Use of AI in Microsoft Azure Cloud, Web Development in Cloud, Software Development in Cloud,, Data Storage in Cloud, Cyber Attack in Cloud, Roles & Responsibilities.	6
Total Hours		**32**

Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
1	**Practical 1** Prepare a documentation on Types of Sensor & IOT Hardware Components including it's Use & Requirements.	2
2	**Practical 2** Create a experiment for Controlling the LED blink rate with the potentiometer interfacing with Arduino.	2
3	**Practical 3** Prepare a experiment for the Detection of the light using photo resistor in Arduino.	2
4	**Practical 4** Prepare a experiment on Interfacing on Servo Motor in Arduino including Motion Sensor & Wires.	2

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Suggested List of Experiments:

Contents : Unit	Topics	Contact Hours
5	**Practical 5** Deploy an experiment on Interfacing on DC Motor in Arduino including Proximity, Pressure Sensor & Wires.	2
6	**Practical 6** Check all the Services that can be correlated in IOT and include it in the necessary IOT Experiments.	2
7	**Practical 7** Create one Smart Gate Management System with Microsoft Azure Cloud using IOT Service.	2
8	**Practical 8** Prepare a Experiment on Smart Light Management System with Thermal Sensor.	2
9	**Practical 9** Prepare a Experiment on Smart Home Management System with Humidity Sensor for controlling the Light, Fan & other equipment.	2
10	**Practical 10** Prepare a Experiment on Smart Traffic Management System with Level Sensor & Electric Current Sensor.	2
Total Hours		**20**

Textbook :

1 Fundamentals of IOT, Rajan Gupta (Author), Supriya Madan (Author)., BPB Publications, 2023

References:

1 “Internet Of Things - A HANDS-ON APPROACH”, “Internet Of Things - A HANDS-ON APPROACH”, Arsheep Bahga (Author), Vijay Madisetti (Author), Universities press, 2015

2 THE INTERNET OF THINGS, THE INTERNET OF THINGS, Ajay Arya (Author), Madiajagan (Author), Karthikumar (Author), Sugandha Singh (Author), Notion Press, 2022

3 Internet of Things, Internet of Things, Surya Dubha, oxford university press, 2021

4 Hands-On Industrial Network Defense: A practical guide to building robust SCADA and DCS networks, Hands-On Industrial Network Defense: A practical guide to building robust SCADA and DCS networks, Bill Gourley, Greg Wilsdon, -, -

Suggested Theory Distribution:

The suggested theory distribution as per Bloom’s taxonomy is as follows. This distribution serves as guidelines for teachers and students to achieve effective teaching-learning process

Distribution of Theory for course delivery

Remember / Knowledge	Understand	Apply	Analyze	Evaluate	Higher order Thinking / Creative
10.00	25.00	25.00	20.00	10.00	10.00

Instructional Method:

1. The course delivery method will depend upon the requirement of content and need of students. The teacher in addition to conventional teaching method by black board, may also use any of tools such as demonstration, role play, Quiz, brainstorming, MOOCs etc.
2. The internal evaluation will be done on the basis of continuous evaluation of students in the laboratory or class-room.

Supplementary Resources:

1. https://mrcet.com/downloads/digital_notes/EEE/IoT%20&%20Applications%20Digital%20Notes.pdf
2. https://en.wikipedia.org/wiki/Internet_of_things
3. AWS IoT Core (for comparison learning) - https://aws.amazon.com/iot-core/
4. Microsoft Learn – Azure IoT - https://learn.microsoft.com/en-us/training/azure/

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