M4-R5

INTERNET OF THINGS AND ITS APPLICATIONS

.. Introduction

The module is designed to equip the students to understand the basics of connected world that is Internet of Things (IoT) and its applications. IoT primarily refers to the connected and smarter world having physical and virtual objects with some unique identities. IoT applications span across domains of industrial control, retail, energy, agriculture, etc.

This module provides the theoretical and practical aspects of interfacing sensors and actuators, making informed world of Things speaking to each other. The different type of communication modes and models are discussed in detail. The in-depth knowledge of software and packages is provided to make applications in IoT paradigm.

!. Objective

After completing the module, the learner will be able to:
 ➢ Understand how connected devices work together to update other applications.

 ➢ Acquire knowledge to interface sensors and actuators with microcontroller based Arduino platform.

 ➢ Writing C programs in Arduino IDE .

 ➢ Understand the Communication between microcontroller and PC using serial communication.

 ➢ Build IoT based applications and understand how data flows between things.

 ➢ Understand how electronic devices control electrical appliances working at 220v AC.

 ➢ Understand security aspect of IoT devices.

 ➢ Enhance skill set towards better personality development.

!. Duration

120 Hours - (Theory: 48hrs + Practical: 72 hrs)

Outline of Module

Module Unit	Duration (Theory) in Hours	Duration (Practical) in Hours	Learning Objectives
1. Introduction to IoT – Applications/Dev ices, Protocols andCommunicati on Model	4	6	After completion of this unit of module, Learner will be able to • Understand various IoT Applications, protocols, architecture, etc. • Understand the characteristics of IoT devices. • Know about Physical Design/Logical Design, Functional blocks of IoT and Communication Models.
2. Things and Connections	4	6	After completing this unit, Learner will be able to understand • Closed loop/ feedback loop system. • The use of sensors, actuators and controllers in the IoT process flow. • TCP/IP Versus OSI models. • Wired and wireless connectivity.
3. Sensors, Actuators and Microcontrollers	8	12	After completing this unit, Learner will be able to understand • The role of Sensors, transducers in measuring physical quantities. • Working and characteristics of actuators. • Role and use of microcontroller in building various electronic devices.

4.	Building IoT Applications	20	30	After completing this unit, Learner will be able to understand
				• Working of microcontroller and hardware prototyping Arduino platform. • The role of 'C' language in building IoT applications. • Built-in Data-type, operators-expressions • Conditional statements and loops. • Arrays, functions. • Digital, analog pins of Arduino. • Interfacing sensors, actuator. • Using ArduBlock GUI tool.
5.	Security and Future of IoT Ecosystem	4	6	After completing this unit, Learner will be able to understand • Need of security in IoT. • Various basic concept of security. • Security levels. • Need of powerful CPU for Future IoT eco system.
6.	Soft skills-Personality Development	8	12	After completing this unit, Learner will be able to understand • Role of positive personality and determinants of personality. • Self-esteem. • Communication and writing skills.

Marks Distribution

Module Unit	Written Marks (Max.)
1. Introduction to IoT – Applications/Devices, Protocols and Communication Model	10
2. Things and Connections	10
3. Sensors, Actuators and Microcontrollers	15
4. Building IoT Applications	40
5. Security and Future of IoT Ecosystem	5
6. Soft skills-Personality Development	20
7. Total	100

M4-R5

INTERNET OF THINGS
AND
ITS APPLICATIONS

SYLLABUS

Detailed Syllabus

(i) Introduction to Internet of Things – Applications/Devices, Protocols andCommunication Model

Introduction - Overview of Internet of Things(IoT), the characteristics of devices and applications in IoT ecosystem, building blocks of IoT, Various technologies making up IoT ecosystem, IoT levels, IoT design methodology, The Physical Design/Logical Design of IoT, Functional blocks of IoT and Communication Models, Development Tools used in IoT.

(ii) Things and Connections

Working of Controlled Systems, Real-time systems with feedback loop e.g. thermostat in refrigrator, AC, etc.Connectivity models – TCP/IP versus OSI model, different type of modes using wired and wireless methodology, The process flow of an IoT application.

(iii)Sensors, Actuators and Microcontrollers

Sensor - Measuring physical quantities in digital world e.g. light sensor, moisture sensor, temperature sensor, etc.

Actuator – moving or controlling system e.g. DC motor, different type of actuators

Controller – Role of microcontroller as gateway to interfacing sensors and actuators, microcontroller vs microprocessor, different type of microcontrollers in embedded ecosystem.

(iv)Building IoT applications

Introduction to Arduino IDE – writing code in sketch, compiling-debugging, uploading the file to Arduino board, role of serial monitor.

Embedded 'C' Language basics - Variables and Identifiers, Built-in Data Types, Arithmetic operators and Expressions, Constants and Literals, assignment.

Conditional Statements and Loops - Decision making using Relational Operators, Logical Connectives - conditions, if-else statement, Loops: while loop, do while, for loop, Nested loops, Infinite loops, Switch statement.

Arrays – Declaring and manipulating single dimension arrays
Functions - Standard Library of C functions in Arduino IDE, Prototype of a function: Formal parameter list, Return Type, Function call.

Interfacing sensors – The working of digital versus analog pins in Arduino platform, interfacing LED, Button, Sensors-DHT, LDR, MQ135, IR. Display the data on Liquid Crystal Display(LCD), interfacing keypad

Serial communication – interfacing HC-05(Bluetooth module)
Control/handle 220V AC supply – interfacing relay module.

(v) Security and Future of IoT Ecosystem

Need of security in IoT - Why Security? Privacy for IoT enabled devices- IoT security for consumer devices- Security levels, protecting IoT devices

Future IoT eco system - Need of power full core for building secure algorithms, Examples for new trends - AI, ML penetration to IoT

(vi) Soft skills-Personality Development

Personality Development - Determinants of Personality- self-awareness, motivation, self-discipline, etc., building a positive personality, gestures.

Self-esteem - self-efficacy, self-motivation, time management, stress management, Etiquettes & manners.

Communication and writing skills- objective, attributes and categories of communication, Writing Skills – Resume, Letters, Report, Presentation, etc. Interview skills and body language.