

Based on Revised Syllabus (M4-R5.1)

इंटरनेट ऑफ थिंग्स एण्ड इट्स एप्लिकेशंस

(Internet of Things and its Applications)

द्वितीय संस्करण

लेखक

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Preface

आज हमारे जीवन का अधिकतर काम कंप्यूटर, इंटरनेट, मोबाइल और अन्य IoT उपकरणों की मदद से पूरा होता है। आज, आप इन उपकरणों या सेवाओं की मदद से दुनियाँ में कहीं भी आसानी से और जल्दी से सूचनाएं भेज सकते हैं। इसके अलावा, आप इंटरनेट की मदद से किसी भी विषय से सम्बंधित डेटा और सूचना एक्सेस कर सकते हैं। इसके लिए आपको कंप्यूटर, इंटरनेट, इंटरनेट ऑफ थिंग्स उपकरणों और IoT सम्बंधित सेवाओं का ज्ञान होना आवश्यक है। कई सरकारी संगठन इन विषयों का ज्ञान प्रदान करने के लिए कुछ प्रोग्राम चलाते हैं। 'ओ' लेवल भी एक आईटी आधारित प्रोग्राम है, जिसे NIELIT (नेशनल इंस्टीट्यूट ऑफ इलेक्ट्रॉनिक्स एंड इंफॉर्मेशन टेक्नोलॉजी) नई दिल्ली द्वारा चलाया और मैनेज किया जाता है।

यह पुस्तक 'ओ' लेवल प्रोग्राम के चौथे पेपर (M4-R5: Internet of Things and its Applications) के नवीनतम पाठ्यक्रम के आधार पर तैयार की गई है। इस पुस्तक को विशेष रूप से इंटरनेट ऑफ थिंग्स (IoT) और एंबेडेड 'सी भाषा का उपयोग करके IoT एप्लिकेशंस को विकसित करने के लिए डिज़ाइन किया गया है। यह पुस्तक इंटरनेट ऑफ थिंग्स, थिंग्स एंड कनेक्शन, सेंसर, एक्ट्यूएटर, माइक्रोकंट्रोलर, IoT डिवाइसेस के लिए सुरक्षा प्रणाली, IoT डिवाइसेस का भविष्य और सॉफ्ट स्किल्स के साथ व्यक्तित्व विकास का गहन ज्ञान प्रदान करती है।

इस पुस्तक को 6 भागों में विभाजित किया गया है तथा इस पुस्तक के प्रत्येक भाग में एक विशेष विषय का वर्णन किया गया है, जैसे कि IoT का परिचय, थिंग्स एंड कनेक्शंस, सेंसर और माइक्रोकंट्रोलर्स, IoT एप्लिकेशन का निर्माण करना, सुरक्षा और भविष्य का IoT इकोसिस्टम, सॉफ्ट स्किल-पर्सनालिटी डेवलपमेंट। इस पुस्तक का प्रत्येक विषय सिद्धांत, उदाहरण और प्रश्नों के साथ दिया गया है। इंटरनेट ऑफ थिंग्स सम्बंधित कुछ महत्वपूर्ण practical/Case study को इस पुस्तक के अंत में दिया गया है।

यह पुस्तक इस विषय का प्रथम संस्करण है। हमने इस पुस्तक को त्रुटियों या अन्य गलतियों के बिना पुरा करने की कोशिश की है, लेकिन फिर भी कुछ त्रुटियाँ हो सकती हैं। इसके लिए हमें आपके सहयोग की आवश्यकता होगी ताकि अगले संस्करण में इसे सुधारा जा सके। किताब की गुणवत्ता में सुधार करने हेतु आपके बहुमूल्य सुझावों के लिए हम आपके आभारी रहेंगे।

Author

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.

Objectives

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 .
- 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)

Sr.	Module Unit or Chapter name	Duration		Marks (Max.)
		Theory	Practical	
1.	Introduction to IoT	4	6	10
2.	Things and Connections	4	6	10
3.	Sensors, Actuators and Microcontrollers	8	12	15
4.	Building IoT Applications	20	30	40
5.	Security and Future of IoT Ecosystem	4	6	05
6.	Soft skills- Personality Development	8	12	20
	Total	48	72	100

DETAILED SYLLABUS

1. Introduction to Internet of Things – Applications/Devices, Protocols and Communication 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.

2. Things and Connections

Working of Controlled Systems, Real-time systems with feedback loop e.g. thermostat in refrigerator, 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.

3. 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, microcontroller vs microprocessor, different type of microcontrollers in embedded ecosystem.

4. 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.

5. 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.

6. 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.

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