

<b>Name of Faculty</b>	:	<b>Faculty of Computer Science &amp; Applications</b>
<b>Name of Program</b>	:	Master of Computer Application (MCA)
<b>Course Code</b>	:	2MCA03
<b>Course Title</b>	:	Internet of Things (IoT)
<b>Type of Course</b>	:	Professional Core
<b>Year of Introduction</b>	:	2023-24

<b>Prerequisite</b>	:	UG level course in C Programming and Networking Basics.
<b>Course Objective</b>	:	This subject has emerged technology with applications in manufacturing, healthcare, agriculture, transport, mining, smart cities, etc. This subject covers the fundamentals with its architecture, protocols, and applications. It also covers the overview and programming of two widely used IoT platforms Arduino and Raspberry Pi.
<b>Course Outcomes</b>	:	At the end of this course, students will be able to:
	CO 1	describe the benefits of IoT technologies for automating real-life challenges in the application areas.
	CO 2	experiment with the functions of the sensors and their interfacing.
	CO 3	demonstrate the architecture and functioning of IoT systems including the sensors and microcontrollers with their interfacing and software needs considering application areas.
	CO 4	discuss IoT protocols by detailing their elements and overall functioning within IoT systems for efficient communication.
	CO 5	analyse IoT systems for utilization of Clouds for computing and storage issues.

#### Teaching and Examination Scheme

Teaching Scheme (Contact Hours)			Credits	Examination Marks				
L	T	P		Theory Marks		Practical Marks		Total Marks
			C	SEE	CIA	SEE	CIA	
2	0	4	4	70	30	30	20	150

*Legends: L-Lecture; T-Tutorial/Teacher Guided Theory Practice; P - Practical, C - Credit, SEE - Semester End Examination, CIA - Continuous Internal Assessment (It consists of Assignments/Seminars /Presentations/MCQ Tests, etc.)*

### Course Content

Unit No.	Topics	Teaching Hours	Weightage	Mapping with CO
1	<b>Introduction to Internet of Things:</b> Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, Enabling technologies, IoT challenges, IoT levels	6	20%	CO1
2	<b>Sensors, Actuators and Interfacing:</b> Types & Working of Sensors, Sensor interfacing, Types & Working of Actuators, Actuators interfacing, Controlling Actuators	6	20%	CO2
3	<b>Microcontrollers, Prototyping Boards and Their Interfacing :</b> Microcontrollers Architecture and its family, register organization of 8051 microcontrollers, features of 8051 Advanced RISC Machine Architecture and its family, registers organization of ARM microcontrollers, features of ARM, Basics of Arduino: Architecture, Arduino Uno Specifications, Basics of Raspberry Pi Architecture, Pi-4 Specifications	8	20%	CO3
4	<b>Protocols for IoT:</b> Protocols for IoT: Messaging protocols: MQTT and CoAP, XMPP and DDS protocols, Transport protocols: BLE and Light Fidelity, Addressing and identification protocol, IPv4, IPv6, URI	6	20%	CO4
5	<b>IoT Application Building with Cloud:</b> Introduction to IoT with cloud, Challenges IoT with cloud, introduction of Fog computing, Working of Fog. IoT applications: Healthcare, Water quality, Retail, Collision impact	4	20%	CO5

### Suggested List of Experiments/Tutorials

Suggested Distribution of Theory Marks Using Bloom's Taxonomy						
Level	Remembrance	Understanding	Application	Analyse	Evaluate	Create
Weightage	30%	40%	20%	10%	-	-

NOTE: This specification table shall be treated as a general guideline for the students and the teachers. The actual distribution of marks in the question paper may vary slightly from above table.

**Suggested List of Experiments/Tutorials**

Sr. No.	Name of Experiment/Tutorial	Teaching Hours
1	Define and Explain Eclipse IoT Project.	06
2	List and summarize few Eclipse IoT Projects.	04
3	Sketch the architecture of IoT Toolkit and explain each entity in brief.	06
4	Demonstrate a smart object API gateway service reference implementation in IoT toolkit.	06
5	Write and explain working of an HTTP- to- CoAP semantic mapping proxy in IoT toolkit.	06
6	Describe gateway-as-a-service deployment in IoT toolkit.	06
7	Explain application framework and embedded software agents for IoT toolkit.	06
8	Explain working of Raspberry Pi.	06
9	Connect Raspberry Pi with your existing system components.	06
10	Give overview of Zetta	06

**Major Equipment/ Instruments and Software Required**

Sr. No.	Name of Major Equipment/ Instruments and Software
1	<a href="https://github.com/connectIoT/iottoolkit">https://github.com/connectIoT/iottoolkit</a>
2	<a href="https://www.arduino.cc/">https://www.arduino.cc/</a>
3	<a href="http://www.zettajs.org/">http://www.zettajs.org/</a>
4	Contiki (Open source IoT operating system)
5	Arduino (open source IoT project)
6	IoT Toolkit (smart object API gateway service reference implementation)
7	Zetta (Based on Node.js, Zetta can create IoT servers that link to various devices and sensors)

**Suggested Learning Websites**

Sr. No.	Name of Website
1	<a href="http://swayam.gov.in/">http://swayam.gov.in/</a>
2	Arduino Uno
3	Arduino software
4	<a href="http://www.arduino.cc">http://www.arduino.cc</a>

**Reference books:**

Sr. No.	Name of Reference Books
1	Vijay Madiseti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014



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2	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2013
3	Cuno Pfister, Getting Started with the Internet of Things, O'Reilly Media, 2011, ISBN: 978-1-4493- 9357-1
4	internet of Things, By Vasudevan, Nagrajan and Sundaram   Wiley India
5	IoT Fundamentals, By David Hence at e I Cisco Press
6	21 IoT Experiments, By Yashavant Kanetkar, Shrirang Korde   BPB
7	IoT Based Projects, By Rajesh Singh at e I BPB