UNIVERSITY OF MADRAS
MASTER OF COMPUTER APPLICATIONS (MCA) DEGREE PROGRAMME
SYLLABUS WITH EFFECT FROM 2023-2024

Title of the Paper	**Internet of Things**		
Elective -VI Theory	II Year & IV Semester	Credit:3	535E4A

Course Objectives:

To get familiar with the evolution of IOT with its design principles

To outline the functionalities and protocols of internet communication

To analyze the hardware and software components needed to construct IOT applications

To identify the appropriate protocol for API construction and writing embedded code

To realize various business models and ethics in Internet of Things

UNIT I: FUNDAMENTALS OF IOT: Evolution of Internet of Things – Enabling Technologies – IOT Architectures: oneM2M, IOT World Forum (IOTWF) and Alternative IOT models – Simplified IOT Architecture and Core IOT Functional Stack –- Fog, Edge and Cloud in IOT – Functional blocks of an IOT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects.

UNIT II - IOT PROTOCOLS : IOT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IOT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT.

UNIT III: DESIGN AND DEVELOPMENT : Prototyping Embedded Devices: Electronics - Embedded Computing Basics – Arduino - Raspberry Pi - Beagle Bone Black - Electric Imp. Prototyping the Physical Design: Non digital Methods - Laser Cutting - 3D printing - CNC Milling - Repurposing/Recycling.

UNIT IV: Prototyping Online Components: Getting started with an API - Writing a New API - Real-Time Reactions - Other Protocols. Techniques for Writing Embedded Code: Memory Management - Performance and Battery Life – Libraries - Debugging.

UNIT V: Business Models: History of Business Models – Model – Internet of Starting up – Lean Startups. Moving to Manufacture: Designing Kits - Designing Printed circuit boards – Certification – Costs - Scaling Up Software. Ethics: Privacy – Control – Environment – Solutions.

Text Books:

1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ⁻ IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017 (UNIT I and II)

2. Adrian McEwen and Hakim Cassimally, "Designing the Internet of Things", Wiley, 2014. (UNIT III, IV and V)

Reference Books:

1. Ovidiu Vermesan and Peter Friess, "Internet of Things – From Research and Innovation to Market Deployment" , River Publishers, 2014.

2. Peter Waher, "Learning Internet of Things" ,Packt Publishing, 2015.

3. Donald Norris, "The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBoneBlack",McGraw Hill, 2015.

Course Outcomes

On the successful completion of the course, students will be able to

CO1	Comprehend the IoT evolution with its architecture and sensors.	K1-K6
CO2	Understand the networking concepts for communication and underlying IoT protocols.	K1-K6
CO3	Assess the embedded technologies and develop prototypes for the IoT products.	K1-K6
CO4	Evaluate the use of Application Programming Interface and design an API for IoT in realitime.	K1-K6
CO5	Recognize the ethics of business models and perform security analysis.	K1-K6

K1- Remember, K2- Understand, K3- Apply, K4- Analyze, K5- Evaluate, K6- Create

Mapping with Programme Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
CO1	S	S	M	S	S	S	S	S	S	S
CO2	S	S	S	S	S	S	S	M	S	S
CO3	S	M	S	S	S	S	M	S	S	M
CO4	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	M	S	S	S	S	M

S- Strong; M-Medium; L-Low