SARVAJANIK UNIVERSITY
Sarvajanik College of Engineering and Technology
Master of Computer Applications

MCA Semester III

Subject Name: Internet of Things and Industry 4.0 **Subject Code:** MTCA13302

Type of course: Professional Core Course

Prerequisite: Fundamentals of Computing, Basics of Electronics, Basic knowledge of Digital Electronics and Microprocessors

List of Courses where this course will be prerequisite:
Embedded System Design, Microcontroller Programming

Rationale: In 21st Century where everything is going distributed, IoT enabled devices connect the world. Billions of devices globally are generating trillions of gigabytes of data every single day. Learning this subject enables student to understand the basics of Internet of things and protocols. It introduces some of the application areas where Internet of Things can be applied. Students will learn about the middleware for Internet of Things.

Teaching and Examination Scheme:

TEACHING SCHEME				Theory Marks			Practical Marks		Total
L	T	P	C	TEE	CA1	CA2	TEP	CA3	
3	0	2	4	60	25	15	60	40	200

CA1: Continuous Assessment (assignments/projects/open book tests/closed book tests **CA2:** Sincerity in attending classes/class tests/ timely submissions of assignments/self-learning attitude/solving advanced problems **TEE:** Term End Examination **TEP:** Term End Practical Exam (Performance and viva on practical skills learned in course) **CA3:** Regular submission of Lab work/Quality of work submitted/Active participation in lab sessions/viva on practical skills learned in course

Content:

Sr. No.	Content	Teaching Hrs.	Module Weightage
1	**Introduction to IoT** IoT Basics, Physical and Logical Designs, IoT Levels and Deployment Templates, IOT Enabling Technologies. Mircrocontrollers and ARM: RISC & CICS machiens, Features of ARM, ARM Architecture, ARM register organization, 8051 Microcontroller architecture, features, memory organization	**12**	**25%**
	IoT and M2M Introduction, M2M, Difference between M2M and IoT, Software Defined Networking (SDN) and Network Function Virtualization (NFV) for IoT. **IoT Architecture**- Reference Model and architecture, IoT reference Model, IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views	**13**	**25%**
3	**IoT Platforms Design Methodology** Introduction, IoT Design Methodology, Case Study on IoT system for Weather Monitoring	**03**	**10%**
4	**IoT with Arduino and Raspberry Pi & Libraries** Introduction to Arduino platform and its programming using readymade libraries Actuators: Study of selected actuators, their operating principles, applications. Sensors: Study of fundamental principles of sensors for various parameters, such as: temperature, humidity, gas, light, etc. Interfacing of WiFi, Bluetooth modules with the Arduino/Raspberry Pi platforms.	**14**	**25%**
5	**Domain Specific IoTs** - Smart Cities, Environment, Retail, Logistics, Health, Home Automation.	**03**	**15%**

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	**U Level**	**A Level**	**N Level**	**E Level**	**C Level**
20	25	15	5	5	30

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

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

Reference Books:

Sr. no.	Title of book /article	Author(s)	Publisher and details like ISBN	Year of publication	Edition
1	Internet of Things: A Hands - on approach	Vijay Madisetti and ArshdeepBahga	Orient Blackswan Private Limited. ISBN: 978-0996025515	2014	1st Edition
2	From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence	Jan Holler, VlasiosTsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle,	Academic Press, ISBN978-0-12-407684-6	2014	1st Edition
3	The Internet of Things: Enabling technologies, platforms, and use cases	Pethuru Raj and Anupama C. Raman	Auerbach Publications ISBN: 978-1498761284	2017	1st Edition
4	Internet of Things with Python	Gaston C. Hillar	Packt Open Source ISBN: 9781785885310	2016	1st Edition
5	The Internet of Things: Do-It-Yourself at Home Projects for Arduino, Raspberry Pi and BeagleBone Black	Donald Norris	McGraw-Hill Education ISBN: 9780071835213	2015	1st Edition
6	The Internet of	Harsent,	Wiley ISBN:	2012	1st

	Things:Key Applications and Protocols	Boswarthick and Elloumi	978-1119994350		Edition
7	Raspberry Pi User Guide	Upton and Halfacree	Wiley ISBN: 9781118464496	2017	4th Edition

Course Outcomes:

Sr. No.	CO Statement After learning this subject, students will be able to	Marks % weightage
CO-1	Understand the components of IoT Architecture and platforms of IoT ecosystem	20%
CO-2	Identify difference between M2M and IoT with SDN and NFV	25%
CO-3	Understand the IoT Platforms Design and Methodology	20%
CO-4	Understand the practical implementation of IoT Systems using Raspberry Pi/Arduino and Python	20%
CO-5	Explore the practicality of IoT in real world cases.	15%

Mapping with POs:

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO-1	2	1	0	1	0	0	1	0	1	0	1	0			
CO-2	1	1	1	1	3	0	1	0	1	0	1	0			
CO-3	1	3	1	2	1	0	1	0	0	0	1	0			
CO-4	1	3	3	1	3	0	3	2	0	0	3	0			
CO-5	1	2	3	3	3	0	2	3	2	3	3	3			
Rationale*															

Rationale*: Explaining why it is matching this particular program outcome

List of Practical:

1.

2. Perform Experiment using Arduino Uno to measure the distance of any object using Ultrasonic Sensor.
3. Perform experiment using PIR/IR Motion Sensor for Motion Detection.
4. Interfacing of Temperature sensor
5. Interfacing of and Gas Sensor with Arduino.
6. Perform experiment using Arduino to Learn Working of Servo Motor.
7. Perform experiment using Pulse sensor to count heartbeat.
8. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LED for 1 sec after every 2 seconds.
9. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
10.
11. Creating a webpage and display the values available through Arduino.
12. Demonstration of Setup Bluetooth Module.
13. Demonstration of Setup Wifi Module.
14. Demonstrate capturing data from sensor and writing it on ThingSpeak cloud using Wifi module.
15. OPEN Ended problem: Students are required to submit an IOT based project using the Microcontroller or a Raspberry Pi and connecting various sensors and actuators. The data for the same should be displayed via a webpage or a web app.

List of Open learning website:

- https://data-flair.training/blogs/iot-tutorial/
- https://www.tinkercad.com/
- https://onlinecourses.nptel.ac.in/noc21_ee85/preview
  (NPTEL Online Course on Design for Internet of Things)
- https://onlinecourses.nptel.ac.in/noc21_cs63/preview
  (NPTEL Online Course on Introduction to internet of things)