CVM UNIVERSITY
Aegis: Charutar Vidya Mandal (Estd.1945)

FACULTY OF ENGINEERING & TECHNOLOGY

Effective from Academic Batch: 2020-21

Programme: **Bachelor of Engineering (Information Technology)**

Semester: **VI**

Course Code: **102046709**

Course Title: **Internet of Things**

Course Group: **Professional Core Course**

Course Objectives: Internet of Things plays an important role in connecting things i.e., variety of devices through the Internet. The IoT has emerged as cutting-edge technology with applications in manufacturing, healthcare, agriculture, transport, mining, smart cities, and many more. This subject covers the fundamentals of IoT with its architecture, protocols, and Applications. It also covers the overview and programming of widely used IoT nodes like Arduino, NodeMCU and Raspberry Pi.

Teaching & Examination Scheme:

Contact hours per week			Course Credits	Examination Marks (Maximum / Passing)				
				Theory		J/V/P*		Total
Lecture	Tutorial	Practical		Internal	External	Internal	External	
3	0	2	4	40 / 14	60 / 21	20 / 7	30 / 10	150 / 52

* **J**: Jury; **V**: Viva; **P**: Practical

Detailed Syllabus:

Sr.	Contents	Hours
1	**Introduction:** Understanding IoT fundamentals, IoT Architecture, and protocols, Various Platforms for IoT Real-time examples of IoT, Overview of IoT components and IoT Communication Technologies, Application areas of IoT, Characteristics of IoT, Things in IoT, IoT stack, Enabling technologies, IoT levels, IoT and cyber physical system, IoT and WSN, Challenges in IoT.	06
2	**Protocols for IoT:** Messaging protocols (HTTP, CoAP, MQTT, AMQP, and XMPP), Transport protocols (Li-Fi, BLE), IPv4, IPv6,6LoWPAN: forwarding, addressing, header compression, neighbor discovery, URI, SDN, Integrating IoT in SDN.	06
3	**Sensors, Microcontrollers, and their Interfacing:** Sensor interfacing, Types of sensors, Controlling sensors, Microcontrollers, ARM.	04
4	**Cloud for IoT**: IoT and cloud, Cloud services — SaaS, PaaS, IaaS, Security in cloud, Fog computing, smart grid.	07

5	**Application building with IoT**: Various application of IoT: Food, Healthcare, Lavatory maintenance, Water quality, Warehouse, Retail, Driver Assistance, Collision impact.	**06**
6	**Arduino and Raspberry Pi:** Arduino: Architecture, Programming and Application Raspberry Pi: Architecture, Programming and Application.	**06**
7	**IoT Security:** Various security issues and need, architecture, requirement, challenges, and algorithms.	**05**
	Total	**40**

List of Practicals / Tutorials:

1	Study of Arduino board and Interfacing of LED (s) with Arduino.
2	Study and implementation of Buzzer, Switches, LCD, keypad, LDR, Ultrasonic sensors and PWM interfacing with Arduino.
3	Study of serial communication and device control using serial communication with Arduino
4	Study and implementation LED (s) Interfacing with NodeMCU.
5	Implementation of Publishing data on thingspeak cloud.
6	Controlling Appliances using NodeMCU MQTT over the Internet. (Adafruit Cloud)
7	Study and Setup Raspberry Pi board.
8	Study and implementation of LED(s) Interfacing with raspberry pi.
9	Study of Node-red programming tool
10	Study and implementation of processing data from different sensors and visualize data on Node-red dashboard.
11	Write a sketch that will upload data (like temperature, Light status, etc) on thingspeak cloud.
12	Case study on IoT Applications like • Home Automation: This home automation system based on IoT automates the functioning of household appliances over the Internet. • Smart Agriculture System: This IoT-based system performs the routine agricultural tasks automatically and allows farmers to focus on more labor-intensive tasks. • Smart Street light monitoring system: The of the major challenges related to street lights is that they are left on even during daylight hours or when there's no one on the street. An IoT-powered street light monitoring system can help us handle this challenge. Besides, the system will also ensure consumption monitoring, low power consumption, and instant faulty light detection. Implementation of mini projects on smart irrigation System, Smart dustbin, Intelligent Building, Smart harvesting, Smart Hospital, Smart classroom, Smart transportation/traffic, Smart Museum etc.

Reference Books:

1	Internet of Things, Vasudevan, Nagrajan and Sundaram, Wiley India
2	IoT Fundamentals, David Hence at el, Cisco Press
3	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1st Edition, VPT, 2014
4	21 IoT Experiments, YashavantKanetkar, ShrirangKorde, BPB

5	IoT Based Projects, Rajesh Singh at el, BPB
6	Internet of Things with ARDUINO and BOLT, Ashwin Pajankar, BPB

Supplementary learning material:	
1	NPTEL Swayam :https://onlinecourses.nptel.ac.in/noc19_cs65/preview
2	https://www.tutorialspoint.com/internet_of_things/index.htm
3	https://www.iotworldtoday.com/
4	https://www.cisco.com/c/en_in/solutions/internet-of-things/overview.html
5	https://www.cisco.com/c/en_in/solutions/internet-of-things/iot-network-connectivity.html
6	https://www.edureka.co/blog/what-is-iot/
7	https://aws.amazon.com/iot/

Pedagogy:

- Direct classroom teaching
- Audio Visual presentations/demonstrations
- Assignments/Quiz
- Continuous assessment
- Interactive methods
- Seminar/Poster Presentation
- Industrial/ Field visits
- Course Projects

Suggested Specification table with Marks (Theory) (Revised Bloom's Taxonomy):

Distribution of Theory Marks in %						**R**: Remembering; **U**: Understanding; **A**: Applying; **N**: Analyzing; **E**: Evaluating; **C**: Creating
R	**U**	**A**	**N**	**E**	**C**	
15%	25%	25%	15%	20%	---	

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.

Course Outcomes (CO):

Sr.	Course Outcome Statements	%weightage
CO-1	To understand the vision of IoT from a global context.	**20**
CO-2	To understand the application of IoT.	**20**
CO-3	Able to use of Devices, Gateways and Data Management in IoT.	**20**
CO-4	Able to build state of the art architecture in IoT.	**20**
CO-5	Able to design and build Application of IoT in Industrial and Commercial Automation and Real-World Design Constraints.	**20**

Curriculum Revision:	
Version:	1.0
Drafted on (Month-Year):	June-2020
Last Reviewed on (Month-Year):	-
Next Review on (Month-Year):	June-2025