Name of the Course: IoT Technologies

Sr. No.	Heading	Particulars
1	**Description the course:**	**Introduction:**
		The Internet of Things (IoT) is an evolving field where devices connect and communicate to automate tasks and share data. This course lays the groundwork by explaining IoT's structure, history, key components, and its interaction with the internet and physical objects.
		Relevance:
		As industries shift toward automation and real-time analytics, understanding IoT has become vital for developing intelligent and connected systems. Its relevance spans domains like healthcare, agriculture, logistics, and smart cities.
		Usefulness:
		This course equips students with practical knowledge to create prototypes, interface sensors and actuators, and understand protocols. The hands-on exposure enhances the ability to design, implement, and troubleshoot IoT systems.
		Application:
		Students apply their knowledge in real-life scenarios such as environmental monitoring, smart homes, precision farming, and intelligent transportation systems. The course provides foundational skills to build IoT-based solutions from scratch.
		Interest:
		IoT offers an exciting blend of hardware, software, and communication, making it engaging for students who enjoy practical problem-solving. Working with microcontrollers and sensors adds a creative, hands-on dimension to learning.
		Connection with Other Courses:
		This course connects well with subjects like Embedded Systems, Computer Networks, Artificial Intelligence, Cloud Computing, and Mobile Application Development. It forms a practical bridge between theoretical concepts and real-world implementations.
		Demand in the Industry:

		The IoT market is booming with demand for professionals skilled in embedded programming, cloud integration, sensor interfacing, and data security. Industries are looking for people who can build, maintain, and scale IoT systems.
		Job Prospects:
		Students completing this course can explore roles like IoT Developer, Embedded Systems Engineer, Firmware Developer, IoT Solution Architect, and Application Developer. With further specialization, it opens doors to R&D, automation, and innovation labs in industries across the globe.
2	**Vertical:**	Major
3	**Type:**	Theory
4	**Credits:**	2 credits (1 credit = 15 Hours for Theory or 30 Hours of Practical work in a semester)
5	**Hours Allotted:**	30 Hours
6	**Marks Allotted:**	50 Marks
7	**Course Objectives (CO):** **CO 1.** To introduce the fundamentals and evolution of IoT, including architecture and design principles. **CO 2.** To explore various IoT platforms, sensors, actuators, and communication protocols. **CO 3.** To impart knowledge of system-on-chip (SoC) architecture and interfacing techniques. **CO 4.** To develop skills in building IoT systems and integrating them with web and cloud technologies. **CO 5.** To create awareness about real-world IoT applications and current trends like Edge and Fog Computing.	
8	**Course Outcomes (OC):** After successful completion of this course, students would be able to - **OC 1.** Understand the core concepts, design, and architecture of IoT systems. **OC 2.** Identify and use various sensors, actuators, and IoT development boards like Raspberry Pi, Arduino, and NodeMCU. **OC 3.** Apply appropriate protocols for communication and ensure secure data exchange. **OC 4.** Design simple IoT applications involving data collection, processing, and visualization. **OC 5.** Analyze IoT use cases and appreciate the role of Edge, Fog, and Cloud in modern applications.	

9	**Modules:-**
	Module 1 (15 hours):
	Introduction to IoT: Definition, Characteristics & Scope of IoT, History & Evolution of IoT, IoT vs M2M, IoT Architectures (Three-layer, Five-layer), Physical & Logical Design of IoT Systems, Enabling Technologies in IoT: Cloud Computing, Big Data, AI, Embedded Systems
	IoT Components & Frameworks: Smart "Things" and their identifiers, Overview of IoT Frameworks (Amazon AWS IoT, Google Cloud IoT, Azure IoT Hub)
	System on Chip (SoC): What is SoC? Structure & Characteristics, SoC Elements: FPGA, GPU, APU, Compute Units, Introduction to ARM and atmega328 Architectures
	IoT Hardware Platforms: Overview and comparison: Raspberry Pi, Arduino, NodeMCU, IoT board capabilities, selection criteria for applications
	Hardware Interfacing & Communication Protocols: Basic components: LED, Button, Camera, Motor, 8×8 LED Grid, Communication protocols: PWM, UART, GPIO, I2C, SPI
	Module 2 (15 hours):
	Sensors & Actuators: Digital and Analog Sensors: Temperature, Humidity, Motion, Light, Gas, Ultrasonic, Interfacing Relay Switch, Servo Motor
	IoT Protocols & Security: Protocols: HTTP, MQTT, CoAP, XMPP, UPnP, Privacy and Security Issues in IoT
	Web & Cloud Integration in IoT: Web server setup for IoT, Data exchange with IoT device, Node-RED basics, Introduction to Cloud Platforms for IoT
	Wireless Sensor Networks (WSNs): Basics, Architecture, Types, Role in IoT communication
	Edge & Fog Computing: Definition, Purpose and Use Cases, Edge vs Fog vs Cloud comparison, Edge architectures and communication models
	IoT Applications: Case Studies in Healthcare, Agriculture, Transportation, Smart Cities
10	**Text Books** 1. Introduction to IoT Paperback by Sudip Misra , Anandarup Mukherjee , Arijit Roy , Cambridge Press, 2022 2. Jain, Prof. Satish, Singh, Shashi, "Internet of Things and its Applications", 1st Edition, BPB, 2020. 3. Shriram K Vasudevan, Abhishek S Nagarajan, RMD Sundaram, Internet of Things, Wiley, India, 2019 4. IoT and Edge Computing for Architects - Second Edition, by Perry Lea, Publisher: Packt Publishing, 2020
11	**Reference Books** 1. Internet of Things by Vinayak Shinde, SYBGEN Learning India Pvt. Ltd, 2020

	2. Internet of things, Dr. Kamlesh Lakhwani, Dr. Hemant kumar Gianey, Josef Kofi Wireko, Kamalkant Hiran, BPB Publication, 2020
	3. Arduino, Raspberry Pi, NodeMCU Simple projects in easy way by Anbazhagan k and Ambika Parameswari k, 2019.
	4. IoT based Projects: Realization with Raspberry Pi, NodeMCU Paperback – February 2020, by Rajesh Singh Anita Gehlot, 2020
	5. Mastering the Raspberry Pi, Warren Gay, Apress, 2014
12	**Internal Continuous Assessment: 40%**	**Semester End Examination: 60%**