LESSON PLAN 2025-26(SUMMER)						
NAME OF THE TEACHER : DEEPAK KUMAR BARDA, LECT.(STAGE II, CSE)						
Subject: **INTERNET OF THINGS(Course Code:TH1)** Program: Diploma in Computer Science and Engineering Semester: 6th Total Contact Hours: 60 Total Marks: 100 Assessment: Internal Assessment – 20, End Term – 80						
After completion of the course, the students will be able to: CO1-Explain the basic concept about the IOT, CO2- IoT Networking CO3-Connectivity Technologies , CO4-Wireless Sensor Networks , CO5-M2M Communication , CO6-Programming with Arduino . CO7-Programming with Raspberry Pi, Software defined Networking,Smart Homes,Smart Cities,Industrial IoT						
Lesson No.	**UNIT**	**Topic/Sub-Topic**	**Learning Objective**	**Activity**	**Homework**	**COURSE OBJECTIVE**
UNIT-1-: Introduction to Internet of Things (6 Hours)						
1	I	Intro & Characteristics	Define IoT and identify its core traits (Connectivity, Sensing, Intelligence).	Smart Object Audit: Identify 3 "dumb" objects and brainstorm how making them "smart" adds value.	Find a news article about a new IoT innovation and summarize its benefits.	**CO1**
2	I	Applications & Categories	Differentiate between Consumer, Commercial, Industrial (IIoT), and Infrastructure IoT.	Market Categorization: Sort a list of 10 devices (e.g., smart grid, pacemaker, Nest) into categories.	Choose one industry (e.g., Agriculture or Health) and list 3 specific IoT use cases.	**C01**
3	I	Sensors & Actuators	Understand how sensors "feel" the world and actuators "change" the world.	Input/Output Logic: Given a scenario (e.g., automatic blinds), identify the sensor and the actuator.	Sketch a simple diagram of a "Smart Home" feature showing the sensor/actuator loop.	**C01**
4	I	Enablers & Connectivity	Identify the tech that makes IoT possible (RFID, NFC, Bluetooth, LPWAN).	Range vs. Power Lab: Compare different connectivity types based on distance and battery life.	Research the difference between WiFi and LoRaWAN for IoT devices.	**CO1**
5	I	Baseline Tech & Implementation	Understand the layers from Device → Gateway → Cloud → Application.	Stack Building: Use cards to "stack" the layers of an IoT solution from the ground up.	List the components needed to build a "Smart Parking" system.	**CO1**
6	I	Challenges of IoT	Evaluate critical hurdles like Security, Privacy, Interoperability, and Power.	The Great Debate: One group argues for the convenience of IoT; the other argues the privacy risks.	Write a 200-word reflection on the biggest security threat facing IoT today.	**CO1**
UNIT-2:- IoT Networking 6 hours)						

7	II	Networking Terminologies	Master key terms: Nodes, Gateways, LPWAN, and 6LoWPAN.	Glossary Match-up: Connect technical terms to their real-world analogies	Create a "Cheat Sheet" of 10 essential IoT networking terms.	**CO2**
8	II	Gateway Prefix Allotment	Understand how IPv6 prefixes are distributed to manage massive device clusters.	Prefix Partitioning: A math-based exercise dividing an IPv6 block among different "smart rooms."	Explain why IPv4 is insufficient for the future of IoT.	CO2
9	II	Impact of Mobility	Analyze how IP addressing breaks or adapts when a device (e.g., a smart car) moves networks.	The Handover Simulation: Roleplay a device moving from one "tower" to another without losing data.	Research "Mobile IP" and write a summary of how it handles address changes.	CO2
10	II	Multihoming in IoT	Explain how connecting to multiple networks prevents system failure.	Network Failover Demo: Map out a critical system (like a hospital) and add redundant links.	List 3 scenarios where multihoming is a "must-have" for safety.	CO2
11	II	Deviation from Regular Web	Compare HTTP/TCP (heavy) vs. CoAP/UDP (lightweight/constrained).	Packet Weight Comparison: Compare the "overhead" size of a standard web request vs. an IoT request.	Create a T-chart: "Regular Web" vs. "Constrained IoT Networks."	CO2
12	II	ID & Data Protocols	Differentiate between MQTT (Publish/Subscribe) and CoAP protocols.	Pub/Sub Roleplay: Students act as "Brokers," "Publishers," and "Subscribers" for data topics.	Compare MQTT and CoAP. Which is better for a battery-powered sensor?	CO2
UNIT-3:- Connectivity Technologies:(6 hours)						
13	III	Introduction to Connectivity	Understand the trade-offs between Range, Power, and Data Rate.	The Connectivity Matrix: Map Bluetooth, WiFi, and Cellular on a graph of Range vs. Power.	Find 3 wireless devices in your home and identify which protocol they likely use.	CO3
14	III	IEEE 802.15.4	Explain the standard that forms the basis for ZigBee and 6LoWPAN.	Packet Dissection: Look at a simplified 802.15.4 frame and identify the Source/Dest IDs.	Research: How does 802.15.4 differ from 802.11 (WiFi)?	CO3
15	III	ZigBee & 6LoWPAN	Compare Mesh networking (ZigBee) vs. bringing IPv6 to small devices (6LoWPAN).	Mesh Simulation: Students pass a message across the room to show how Mesh nodes relay	Draw a diagram showing a 6LoWPAN Edge Router connecting to the Internet.	CO3
16	III	RFID & HART/WirelessHART	Explain how passive tracking (RFID) and industrial process tools (HART) work.	Tag Hunting: Use a phone's NFC/RFID reader to "detect" credit cards or transit passes.	Explain why WirelessHART is preferred in a noisy factory over standard WiFi.	CO3

17	III	NFC, Bluetooth & Z-Wave	Differentiate between proximity (NFC), peripheral (BT), and home automation (Z-Wave) tech.	The Pairing Process: Analyze the security steps during a Bluetooth "Handshake."	List 5 smart home devices and categorize them as either Z-Wave or Bluetooth.	CO3
18	III	ISA100.11.A & Review	Understand industrial-grade wireless reliability and review all protocols.	The Protocol Draft: Pick a scenario (e.g., Oil Rig) and "draft" the best connectivity tech for it.	The Protocol Draft: Pick a scenario (e.g., Oil Rig) and "draft" the best connectivity tech for it.	CO3
UNI-4:-Wireless Sensor Networks (10 hours)						
19	IV	Introduction, Components of a sensor node	Understand the architecture of a WSN and the hardware constraints of individual nodes.	Hardware Teardown: Use a diagram or physical Arduino/MicaZ node to identify the MCU, Transceiver, and Power unit.	Research and list 3 types of sensors (e.g., DHT11, MQ2) and their power consumption.	CO4
20	IV	Modes of Detection, WSN Coverage	Explain how sensors "see" the world (Binary vs. Range) and how to ensure no "blind spots" exist.	Coverage Mapping: Draw a 2D grid and place "nodes" (circles) to calculate the minimum nodes needed for 100% coverage.	Solve a basic coverage problem: Calculate area covered by 5 nodes with a 10m sensing radius.	CO4
21	IV	Challenges, Cooperation, Self-Management	Identify energy/bandwidth constraints and how nodes self-organize without human intervention.	The "Ad-Hoc" Game: Students act as nodes; pass a "data packet" to a destination using only neighbors, simulating self-healing.	Write a 200-word summary on why "Energy Harvesting" is vital for WSN self-management.	CO4
22	IV	Multimedia WSN, Nanosensor Networks, Underwater WSN	Distinguish between scalar data (temp) and complex data (video/underwater acoustic).	Media Debate: Discuss why sending video over WSN is harder than sending temperature data (bandwidth vs. latency).	Compare Acoustic vs. Radio waves for underwater communication in a table.	CO4
23	IV	Sensor Web, Social sensing WSN	Understand how WSNs integrate with the Internet and how humans act as "mobile sensors."	App Analysis: Identify how apps like Waze or Google Maps use "Social Sensing" to detect traffic.	Design a concept for a "Social Sensing" app for a smart campus.	CO4
24	IV	Applications, Stationary vs. Mobile WSN	Evaluate real-world use cases and the pros/cons of moving nodes (drones/robots).	Case Study: Groups design a WSN for a specific scenario (e.g., Forest Fire detection vs. Warehouse tracking).	Create a final comparison chart: Stationary WSN vs. Mobile WSN (Cost, Coverage, Maintenance)	CO4
UNIT-5:- M2M Communication (6 hour)						

25	V	Introduction to M2M Communication	Define M2M and distinguish it from general IoT (Point-to-point vs. IP-based).	Case Comparison: In pairs, list 3 scenarios that are "Pure M2M" (e.g., ATM low-cash alert) vs. 3 that are "IoT" (e.g., Smart Home app).	Find a news article about a "Smart City" initiative and identify 2 M2M-specific tasks mentioned.	CO5
26	V	M2M Ecosystem: Device & Network Layers	Identify the roles of sensors, actuators, and communication modules (eSIM/eUICC).	Module Inspection: Examine a specification sheet for a cellular M2M module (like Quectel or Telit) to find its power and band specs.	Draw a block diagram of a "Smart Vending Machine" ecosystem including the sensor, network, and dispatcher.	CO5
27	V	Stakeholders & Value Chain	Map the players: Device OEMs, Network Operators (MNOs), and System Integrators.	Stakeholder Roleplay: Groups represent an MNO, a Hardware Vendor, and a Factory Owner to negotiate an M2M contract.	Research 3 major global M2M connectivity providers (e.g., Vodafone, AT&T, China Mobile).	CO5
28	V	M2M Service Platform: Architecture	Understand the functional layers (Application, Common Services, and Network).	Architecture Mapping: Use a whiteboard to map the "OneM2M" standard layers onto a real-world fleet tracking system.	List 5 "Common Services" a platform must provide (e.g., Security, Device Mgmt).	CO5
29	V	Device Mgmt & Data Analytics	Explain how platforms handle "Massive M2M" (provisioning, firmware updates, and billing).	Dashboard Mockup: Design a UI for a service platform that monitors 1,000 smart streetlights. What alerts are needed?	Explain the difference between "Device Management" and "Data Management" in a service platform.	CO5
30	V	Summary of : End-to-End M2M Solution	Synthesize all components into a functional system design.	Final Design Sprint: In groups, design an M2M solution for a "Smart Hospital" (from patient sensor to billing platform).	Create a 1-page "Executive Summary" for the M2M solution designed in class today.	CO5
UNITS-6:-Programming with Arduino (5 Hour)						
31	VI	Features of Arduino, Components (Part 1)	Identify different Arduino models (Uno, Nano, Mega) and their unique features like clock speed and I/O count.	Hardware Scavenger Hunt: Give students an Arduino Uno and a datasheet; have them locate the ATmega328P chip, Voltage Regulator, and Crystal Oscillator.	Research the difference between "Microprocessors" and "Microcontrollers."	CO6
32	VI	Components of Arduino Board (Part 2)	Understand the difference between Digital, Analog, and PWM pins, and how to power the board safely.	Pin Mapping: Use a breadboard to connect an LED to a Digital pin and a Potentiometer to an Analog pin (no coding yet).	Draw a diagram of the Arduino Uno board and label every header pin and its primary function.	CO6

33	VI	Arduino IDE & The Sketch Structure	Navigate the IDE, understand void setup() vs void loop(), and learn to compile/upload.	"Blink" Modification: Load the example Blink sketch. Change the delay values to create a "heartbeat" rhythm and upload it to the board.	Install Arduino IDE on a home PC/Laptop and explore the "Examples" menu. List 3 examples found there.	CO6
34	VI	Programming Fundamentals in Arduino	Learn basic syntax: pinMode(), digitalWrite(), analogRead(), and variables.	Serial Monitor Lab: Write a sketch that reads a button press and prints "Button Pressed!" to the Serial Monitor on the computer screen.	Write a "pseudocode" (plain English) logic for a system that turns on a light only when it is dark outside.	CO6
35	VI	Case Studies (Smart Agriculture & Home Security)	Analyze how sensors and actuators work together in a complete system.	Mini-Project Design: In groups, sketch a circuit for a "Smart Plant Waterer" using a Soil Moisture sensor and a Relay.	Research one famous Arduino project from "Arduino Create" or "Instructables" and explain the code logic used.	CO6
UNIT-7- Programming with Raspberry Pi (5 hours)						
36	VII	RPi Architecture	Distinguish between a Microcontroller (Arduino) and a Microcomputer (RPi). Understand SoC (System on Chip).	Virtual Tour: Inspect an RPi 4/5 board. Identify the CPU (ARM), RAM chips, HDMI ports, and USB 3.0 controller.	Research the history of Raspberry Pi and why it uses the ARM architecture instead of x86.	CO7
37	VII	Pin Configuration	Master the 40-pin header. Differentiate between Power, Ground, and GPIO pins.	Pin Mapping Exercise: Using a printout of the GPIO map, students must find specific pins for I2C, SPI, and UART protocols.	Draw a diagram showing the difference between "Physical Pin Numbering" and "BCM Numbering."	CO7
38	VII	Setup for IoT (Linux Basics)	Learn to navigate the Raspberry Pi OS (Raspbian) and use the terminal for basic commands.	Terminal Challenge: Boot into the OS. Use ls, cd, and mkdir to create a project folder. Run a "Hello World" Python script.	Install a terminal emulator (like PuTTY or Terminal) on a home PC and research "SSH."	CO7
39	VII	Implementation of IoT with RPi	Learn to control physical hardware using Python libraries (RPi.GPIO or GPIO Zero).	LED & Cloud: Write a Python script to blink an LED. Then, modify it to log the "Status" to a local text file (Data Logging).	Write a Python script (pseudocode) that reads a PIR motion sensor and saves a timestamp when movement is detected.	CO7

40	VII	Real-world Applications	Analyze complex use cases like Media Servers, Home Automation Hubs, and Edge AI.	Case Study Analysis: Group discussion on using RPi for a "Smart Mirror" vs. an "Automated Surveillance Camera" (OpenCV).	Choose one RPi case study and list all the peripheral components needed to build it (Sensors, Camera, etc.).	CO7
UNITS-8:-Software defined Networking (6 hour)						
41	VIII	Limitations of current network	Identify issues with vertical integration, vendor lock-in, and manual configuration complexity.	The "Config Jam": In groups, students simulate manual CLI updates for 10 "routers." Time how long it takes to find and fix a human typo.	Research "Ossification of the Internet" and write 3 ways it hinders new protocol deployment.	CO8
42	VIII	Origin of SDN	Trace SDN from the Stanford "Clean Slate" project and the evolution of Control/Data plane separation.	Timeline Mapping: Create a visual timeline from Active Networking (1990s) to 4D/Ethane and finally OpenFlow.	Read the original 2008 OpenFlow paper and list the two main goals of the authors.	CO8
43	VIII	SDN Architecture	Map the relationship between the Infrastructure, Control, and Application layers.	Layer Logic: Use blocks or a whiteboard to build an SDN stack. Label the Northbound (REST) and Southbound (OpenFlow) APIs.	Draw the SDN Architecture diagram showing the flow of a "Packet-In" request from switch to controller.	CO8
44	VIII	Rule Placement, OpenFlow Protocol	Understand how flow tables work (Match, Action, Counter) and the challenges of limited TCAM memory.	Flow Table Builder: Given a network map, write 3 OpenFlow rules (e.g., Match: Port 1, Action: Forward to Port 3) to route a specific flow.	Define "Proactive" vs "Reactive" rule placement and list one advantage for each.	CO8
45	VIII	Controller Placement	Analyze the "Controller Placement Problem" (CPP) regarding latency, reliability, and load balancing.	Placement Strategy: On a distributed campus map, students mark the "optimal" spots for 3 controllers to minimize latency.	Compare two major SDN controllers: OpenDaylight vs. ONOS in a brief table.	CO8
46	VIII	Security in SDN	Identify SDN-specific threats (Control hijacking) and SDN-based defenses (Dynamic quarantine).	Threat Modeling: "Be the Hacker." Identify the single point of failure in an SDN and brainstorm how to protect the Southbound channel.	Summarize how "FortNOX" or a similar SDN security application prevents rule conflicts.	CO8
UNITS-9:- Smart Home Technology (5 hour)						

47	IX	The Evolution of Smart Homes	Trace the origin of home automation (X10 to IoT) and identify modern examples.	Timeline Challenge: Students work in pairs to order tech inventions from 1970 to today.	Find 3 "unusual" smart devices online (e.g., smart forks, mirrors) and explain their purpose.		CO9
48	IX	Smart Home Implementation	Understand the ecosystem of hubs, sensors, and actuators.	The "If-This-Then-That" (IFTTT) Logic Map: Sketch a flow chart for a specific automation (e.g., a "Morning Routine").	Research the difference between "Zigbee" and "Z-Wave" protocols.		CO9
49	IX	Home Area Networks (HAN)	Explain how devices communicate via Wi-Fi, Bluetooth, and Mesh networks.	Network Mapping: Draw a diagram of a typical home network including the ISP, Router, and connected devices.	Conduct a "Smart Audit" of your own home or a friend's; count the connected devices.		CO9
50	IX	The Benefits	Analyze how smart homes improve energy efficiency, accessibility, and security.	The Efficiency Debate: Calculate potential energy savings from smart thermostats vs. traditional ones.	Write a short pitch for a smart home setup designed specifically for an elderly person.		CO9
51	IX	Issues & Ethics	Critically evaluate privacy risks, data security, and the "e-waste" problem.	The Privacy Trial: Half the class defends smart tech; the other half argues the risks of data breaches.	Reflection paper: "Would you live in a 100% automated home? Why or why not?"		CO9
UNITS-10:- Smart Cities (5 Hour)							
52	X	Characteristics & Frameworks	Define a Smart City and identify the layers (Sensing, Network, Application).	City Blueprint: In groups, students label the layers of a smart city on a large map (e.g., sensors in roads vs. cloud storage).	Research a real-world Smart City (e.g., Singapore, Barcelona) and list three "smart" features they use.		CO10
53	X	Challenges & Data Fusion	Understand the difficulty of integrating massive datasets from different sources.	The Data Fusion Puzzle: A roleplay where "Traffic Data" and "Weather Data" must be combined to predict road safety.	Find an article about a data breach or privacy concern in a smart city context.		CO10
54	X	Smart Parking Systems	Analyze how IoT reduces urban congestion and emissions.	Algorithm Design: Create a logic flow for a parking app: If Sensor A = 0, Navigate User to Spot A; If Sensor A = 1, Check Sensor B.	Observe a local parking lot. List 3 ways sensors could improve the driver's experience there.		CO10

55	X	Energy Management	Explain "Smart Grids" and how they balance supply and demand.	The Grid Balance Game: Simulating a "Peak Hour" where students must decide which city sectors get power priority.	Define "Demand Response" and explain how it helps the environment in 200 words.	CO10
56	X	Capstone: Integrated Smart Urbanism	Synthesize all units to propose a solution for a modern urban problem.	"The Mayor's Pitch": Students present a 3-minute proposal for one smart upgrade to their own city.	Final Reflection: "Which is more important for a smart city: better hardware or better data privacy laws?"	CO10
UNITS-11:-Industrial IoT (4 HOUR)						
57	XI	Requirements & Design	Identify IIoT essentials like low latency, high reliability, and ruggedized hardware.	Rugged Design Lab: Students are given a scenario (e.g., a steel mill or deep-sea oil rig) and must list 5 environmental protections their sensors need.	Research the difference between "Consumer IoT" and "Industrial IoT" in terms of device lifespan.	CO11
58	XI	Applications of IIoT	Explore Predictive Maintenance, Asset Tracking, and Digital Twins.	The Digital Twin Concept: Draw a "live" map of a warehouse where sensors track forklift location, battery life, and shelf weight.	Find one case study of a company using IIoT (e.g., John Deere, Maersk, or Siemens) and summarize it.	CO11
59	XI	Benefits of IIoT	Quantify improvements in efficiency, worker safety, and waste reduction.	The Downtime Calculator: Calculate the cost of 1 hour of factory downtime vs. the cost of installing vibration sensors to prevent it.	Write a 1-page pitch to a factory owner explaining why IIoT is a "must-have" for safety.	CO11
60	XI	Challenges of IIoT	Discuss legacy system integration, cybersecurity, and the skill gap.	The Integration Debate: How do you connect a 30-year-old "dumb" machine to the internet? Brainstorm "Retrofitting" solutions.	Reflection: "What is the biggest barrier to Industry 4.0: The cost of tech or the lack of trained workers?"	CO11

Deepak L M
22.12.2025

Signature of Teacher **Signature of HOD**