Name of Event: IoT & PCB Design Workshop with ESP32

Date of Event: 16/02/2026 to 21/02/2026 (5 Days)

Time of event: 9.00AM to 6.00PM

Organized By: Department of Electronics & Telecommunication Engg.

Name of Event Coordinator: Prof. Shridevi Kumbhare & Prof. Vaishali Bhimte

Name of Resource Person/ Speaker: Mr. Vipul Shinde, DSES Pvt. Ltd.

Brief Introduction of Resource Person/Speaker:

Mr. Vipul Shinde is a dedicated and innovative Embedded Application Engineer with a robust background in electronics and telecommunication engineering, having earned his degree from NB Navale Sinhgad College of Engineering in 2019.

Currently, Mr. Vipul Shinde is working as an Embedded Developer at Dnyanda Sustainable Engineering Solutions Private Limited, starting in April 2024. He excelled in system software development, PCB design and team supervision, earning recognition as the "Best Accountable Person" in Q3 2023.

He is proficient in Embedded C, STM32F7 & H7 series, and PCB design tools like Altium Designer and KiCad. Mr. Vipul Shinde has led projects from conception to deployment, including the development of Bluetooth-based applications and collision avoidance systems.

Objectives of the Workshop:

1. **Introduce participants to the fundamentals of IoT concepts and ESP32 microcontroller programming** by learning IoT concepts and working with the ESP32, participants gain strong foundational knowledge in embedded systems and connected devices.
2. **Provide hands-on experience in interfacing sensors, actuators, and cloud services for IoT applications** Here they learn how real-world IoT systems collect data, automate processes, and communicate with cloud platforms.
3. **Teach participants PCB design using KiCad, covering schematic creation, component placement, routing, design rule checks and Gerber file generation** Through training in KiCad, participants develop the ability to design professional printed circuit board

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4. **Equip participants with the skills to combine IoT hardware and PCB design, creating functional, manufacturable projects** so, participants learn complete product development—from concept to working prototype
5. **Encourage problem-solving through real-world project assignments, enhancing creativity and practical knowledge.**

No. Of beneficiaries: 62

Brief About Event:

The **IoT & PCB Design Workshop with ESP32** is a 5-day hands-on training program organized by for Second year students under the guidance of Dr. Amar Deshmukh, Head of the Electronics & Telecommunication Engineering Department. The session started with the felicitation of resource person Mr. Vipul Shinde by Dr. Amar Deshmukh, Head E & TC Dept. Prof. Shridevi Kumbhare gave the brief introduction of resource person and discussed five days schedule of workshop.

The workshop aims to equip participants with practical skills in IoT system development, ESP32 programming, sensor and actuator interfacing, cloud integration, and professional PCB design using KiCad. Guided by industry expert Mr. Vipul Shinde, participants will learn to design and develop functional, manufacturable IoT projects while enhancing problem-solving and creative engineering skills.

Photo 1: Student Attending Sessions

On Day 1 (16/02/2026) of the workshop, students were introduced to the fundamentals of the Internet of Things (IoT), features and architecture of the ESP32 with it's Development Environment Setup. A detailed explanation of the ESP32 development board pin configuration was provided, followed by hands-on practice in writing and uploading basic programs such as LED blinking.

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On Day 2 (17/02/2026) of the workshop, detailed sessions on sensor and actuator interfacing using the ESP32 was conducted. Students learned how to interface environmental and motion sensors such as the DHT22 and the PIR sensor to read temperature, humidity and motion data. They also learned about breadboard connections, GPIO configuration and debugging techniques.

Photo 2: students actively engaged in hands-on activities

Photo 3: Students active participation in the workshop

On Day 4 (20/02/2026), students were introduced to the fundamentals of Printed Circuit Board (PCB) design. Students were then introduced to KiCad and guided through its interface, tools and project workflow. They learned how to create a new project, manage libraries, and begin schematic design for their IoT Temperature and Motion Monitoring System.

On Day 3 (18/02/2026) of the workshop, students explored cloud integration and learned how to build complete IoT systems using the ESP32. Students were then guided through ESP32 Wi-Fi programming, including connecting the board to a wireless network and transmitting sensor data to cloud dashboards. A project demonstration on an IoT Temperature and Motion Monitoring System was conducted, where students combined sensors, actuators and displays into a functional system.

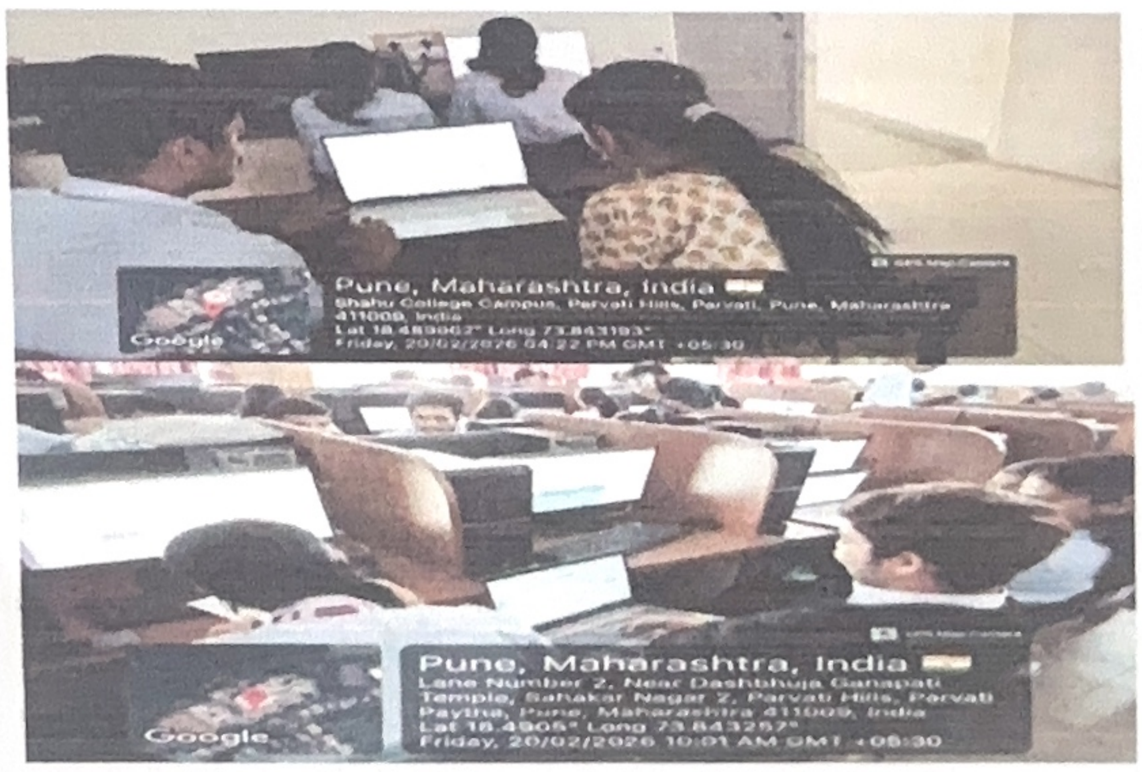

Photo 4: Students doing PCB Design

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Photo 5: Students attending PCB Design Sessions of workshop

In the subsequent sessions of **Day 5 (21/02/2026)**, students completed the schematic of their IoT Temperature and Motion Monitoring System by verifying connections and assigning appropriate footprints to all components in KiCad. They were then introduced to PCB layout design, including board outline creation, component placement strategies, and routing fundamentals.

By the end of the workshop, students understood the complete workflow from IoT prototyping on a breadboard to professional PCB manufacturing, gaining the confidence to independently design and implement their own hardware projects. Workshop ended with the guidance and vote of thanks from Dr. Amar Deshmukh, Head of E & TC Department.

Outcomes of the Workshop:

- **CO1:** Explain fundamental IoT concepts, embedded systems architecture, and the features of the ESP32 microcontroller for connected applications.
- **CO2:** Interface sensors and actuators with ESP32 and develop embedded programs to collect, process, and transmit data to cloud platforms.
- **CO3:** Design and simulate electronic circuits using KiCad, including schematic capture, PCB layout, routing, design rule checks (DRC), and Gerber file generation.
- **CO4:** Develop a functional IoT-based hardware prototype by integrating ESP32 firmware, peripheral devices, and a custom-designed PCB.
- **CO5:** Analyze real-world IoT problems and develop cost-effective, ethical and manufacturable engineering solutions through mini-project implementation.

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CO/PO/PSO Mapping with Justification:

CO1	Explain fundamental IoT concepts, embedded systems architecture, and ESP32 features	**PO1** - Engineering Knowledge	Students applied IoT and embedded system concepts, including ESP32 architecture and peripherals.
		PO2 - Problem Analysis	Analyzed ESP32 capabilities and limitations for connected applications.
		PO5 - Modern Tool Usage	Familiarity with ESP32 development tools, cloud platforms, and embedded IDEs.
		PO10 - Communication	Explained concepts and architecture during discussions and presentations.
		PSO1	Applied knowledge of embedded hardware and IoT architecture to understand and analyze system specifications.
		PSO2	Gained preliminary understanding of hardware-software functional blocks for connected applications
CO2	Interface sensors and actuators with ESP32 and develop embedded programs	**PO1** - Engineering Knowledge	Applied knowledge of interfacing digital/analog sensors and actuators.
		PO2 - Problem Analysis	Analyzed input/output data from sensors and developed correct program logic.
		PO3 - Design/Development	Developed embedded programs for data acquisition, processing, and transmission.
		PO5 - Modern Tool Usage	Used ESP32 IDE, cloud APIs, and programming tools effectively.
		PO9 - Individual & Team Work	Collaborative sensor interfacing and firmware development.
		PSO1	Designed sensor-actuator interfacing circuits for specific functional requirements.
		PSO2	Implemented functional blocks using ESP32 firmware to collect, process, and transmit data.
CO3	Design and simulate electronic circuits using KiCad	**PO1** - Engineering Knowledge	Applied electronics and circuit theory to design schematics.
		PO3 - Design/Development	Designed and simulated circuits, PCB layout, routing, and Gerber generation.
		PO4 – Investigation	Verified circuit design via DRC and simulation, troubleshooting errors.
		PO5 - Modern Tool Usage	Used KiCad as a modern EDA tool for PCB design and simulation.
		PO9 - Individual & Team Work	Worked in teams for schematic verification and layout decisions.
		PSO1	Analyzed circuit specifications and designed schematics and PCB layouts to meet requirements.
		PSO2	Simulated and implemented circuit designs using

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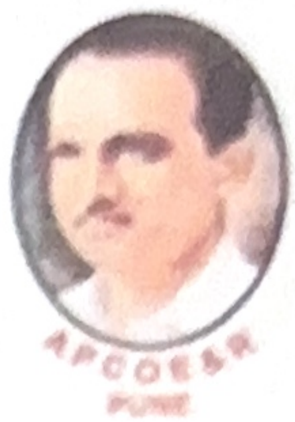

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			KiCad including DRC and Gerber generation.
		PO1 - Engineering Knowledge	Integrated ESP32 firmware, sensors, actuators, and custom PCB.
		PO3 - Design/Development	Designed a working embedded hardware system.
		PO5 - Modern Tool Usage	Used modern development tools for firmware and PCB integration.
		PO6 - Engineer & Society	Prototype addresses practical IoT needs, e.g., monitoring or automation.
		PO7 - Environment & Sustainability	Considered energy-efficient and resource-optimized design.
		PO8 - Ethics	Followed ethical design and implementation practices.
		PO9 - Individual & Team Work	Worked in teams to integrate hardware, firmware, and peripherals.
		PO10 - Communication	Communicated design and integration workflow in presentations.
		PO11 - Project Management	Managed hardware resources, PCB design, and firmware development.
		PSO1	Designed complete hardware including ESP32, sensors, and PCB to meet functional specifications.
		PSO2	Implemented integrated hardware-software prototype, tested for real-world application.
		PSO3	Developed a socially relevant IoT solution with ethical design considerations and real-world applicability.
CO4	Develop a functional IoT-based hardware prototype		
		PO1 - Engineering Knowledge	Applied engineering knowledge to real-world IoT problem scenarios.
		PO2 - Problem Analysis	Analyzed requirements and constraints for practical IoT systems.
		PO3 - Design/Development	Designed cost-effective and manufacturable IoT solutions.
		PO5 - Modern Tool Usage	Used tools and IoT platforms to implement solutions efficiently.
		PO7 - Environment & Sustainability	Considered sustainability and energy efficiency in the solution.
		PO8 - Ethics	Ensured ethical design, safety, and data integrity.
		PO9 - Individual & Team Work	Collaborative project work and team-based problem solving.
		PO10 - Communication	Presented and documented solutions clearly.
		PO11 - Project Management	Managed project resources, cost, and implementation timeline.
CO5	Analyze real-world IoT problems and develop cost-effective, ethical solutions	**PSO1**	Applied engineering knowledge to design cost-

			effective, manufacturable solutions.
		PSO2	Integrated software-hardware solutions for real-world IoT applications.
		PSO3	Ensured ethical, sustainable, and socially responsible solutions, fostering entrepreneurial and professional skills.

Photographs:

Photo 6: Dr. Amar Deshmukh HoD E &TC felicitating Mr. Vipul Shinde Workshop Resource Person

Photo 7: Dr. Amar Deshmukh Head E&TC Dept. Addressing Students about Importance of Workshop

Photo 8: Workshop participants with Trainer, HoD E & TC and Coordinator

Date: 25/02/2026

S.B. Kumbhare 27/02/2026	27/02/2026	27-2-26
Prof. S. B. Kumbhare & Prof. V. V. Bhimte	**Dr. A. B. Deshmukh**	**Dr. S. B. Thakare**
Workshop Coordinator	**HOD, E & TC Department**	**Principal**

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