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DEPARTMENT OF MECHANICAL ENGINEERING
ACADEMIC YEAR 2024-25 (EVEN)
INTERNAL STAFF SEMINAR REPORT

Date& time   : 28.03.2025 & 12.30 P.M.
Venue   : Department Smart Classroom
Topic   : Seminar on "IoT Based Predictive Maintenance for Heavy Machineries"
Resource person   : Mr. S. Nelson Raja,
                      Assistant Professor,
                      Mechanical Engineering,
                      Kings College of Engineering-Punalkulam.

On behalf of the Department of Mechanical Engineering organized an Internal Seminar on "IoT Based Predictive Maintenance for Heavy Machineries" for faculty members of the Mechanical Department on 28.03.2025 at smart class room. The main objective of the internal seminar is to provide exposure to our faculty members on various research areas in IoT in Mechanical Engineering.

The Following Points were Discussed During the Session:
- The advent of the Internet of Things (IoT) has revolutionized industrial operations, particularly in the field of predictive maintenance for heavy machinery. Predictive maintenance (PdM) leverages IoT technology to monitor machine health in real-time, helping industries minimize unexpected failures, reduce downtime, and optimize operational efficiency.
- Traditionally, maintenance strategies were either reactive (fixing issues after failure) or preventive (scheduled servicing regardless of actual machine condition). However, predictive maintenance takes a data-driven approach, using IoT-enabled sensors to continuously collect and analyze key performance indicators such as vibration, temperature, pressure, and lubrication levels. These sensors transmit data to cloud-based platforms, where artificial intelligence (AI) and machine learning (ML) algorithms assess patterns and predict potential failures before they occur.
- A typical IoT-based predictive maintenance system consists of multiple layers. The data acquisition layer involves sensors and actuators collecting real-time machine data. The edge processing layer performs initial analysis to reduce data transmission load. The cloud and analytics layer utilizes AI/ML models for deep insights and failure prediction, while the user interface layer provides dashboards, alerts, and recommendations to maintenance teams.
- The benefits of predictive maintenance using IoT are substantial. Industries experience significant reductions in unplanned downtime, leading to improved productivity and cost savings. Additionally, it extends the lifespan of heavy machinery, enhances worker safety, and optimizes maintenance scheduling.

- Real-world applications of IoT-based predictive maintenance span across various industries, including manufacturing, mining, oil & gas, and transportation. Companies using this technology have reported increased efficiency and substantial cost reductions. With advancements in AI, 5G connectivity, and digital twin technologies, the future of IoT-driven predictive maintenance looks promising, making it an essential component of modern industrial operations

Snapshots of the Session

Chapters Discussed:
- Introduction to Predictive Maintenance (PdM)
- Role of IoT in Predictive Maintenance
- Types of Sensors Used
- IoT Architecture for Predictive Maintenance
- Data Processing and AI/ML Integration
- Benefits of IoT-Based Predictive Maintenance
- Challenges and Limitations
- Case Studies & Real-World Implementations
- Future Trends in IoT-Based Predictive Maintenance

Upon listing of this seminar the participants can able to

- Understand the various types Predictive Maintenance (PdM).
- Understand the concepts IoT in Predictive Maintenance (PdM).
- Research gap of IoT in Mechanical Engineering.

References:

1. Sherien Elkateb, et all. "Machine learning and IoT – Based predictive maintenance approach for industrial applications" Alexandria Engineering Journal, Volume 88, February 2024, Pages 298-309.
2. Iyad Katib, et all. "Safeguarding IoT consumer devices: Deep learning with TinyML driven real-time anomaly detection for predictive maintenance" Ain Shams Engineering Journal Volume 16, Issue 2, February 2025, 103281.
3. Vishal Gupta, et all "Predictive maintenance of baggage handling conveyors using IoT" Computers & Industrial Engineering Volume 177, March 2023, 109033.
4. Stijn Loeys, et all. "The use of IoT sensor data to dynamically assess maintenance risk in service contracts" European Journal of Operational Research. Available online 8 February 2025.
5. Anna N. Gummadi, et all. "A systematic evaluation of white-box explainable AI methods for anomaly detection in IoT systems" Internet of Things Volume 30, March 2025, 101505.

Feedback Analysis:

Coordinator　　　　　　HOD/MECH.　　　　　　Principal