A Seminar on

AI-Driven Revolution: Smart Control in Chemical Processing

Activity Report

Academic Year	2024-25
Program Driven by	A Seminar on AI-Driven Revolution: Smart Control in Chemical Processing
Quarter	II
Program / Activity Name	A Seminar on AI-Driven Revolution: Smart Control in Chemical Processing
Program Type	
Program Theme	Innovation and startups
Start Date	08-02-2025
End Date	08-02-2025
Duration of the Activity (in Mins)	60
Number of Student Participant	50
Number of Faculty Participant	70
Number of external Participant	--
Expenditure Amount in Rs.	
Any Remark	--
Mode of Session Delivery	Offline
Objective	
Benefit in terms of Learning / Skills / Knowledge obtained	
Feedback	
Video url (mp4)	
Photograph 1 (jpg)	Attached
Photograph 2 (jpg)	Attached
Overall report of the Activity (pdf)	As given below

Dr. P. H. Zope

Convener IIC

A Seminar on AI-Driven Revolution: Smart Control in Chemical Processing

Presentation Report on AI-Driven Revolution: Smart Control in Chemical Processing

Introduction A presentation on **"AI-Driven Revolution: Smart Control in Chemical Processing"** was conducted on [Date] at [Venue]. The session focused on the transformative role of AI in optimizing and automating chemical process control. The presentation covered various AI-driven innovations, their applications, benefits, and future implications in the chemical industry.

Objectives of the Presentation

- To introduce AI applications in chemical process control.
- To demonstrate AI-driven process optimization and automation.
- To discuss predictive maintenance and fault detection using AI.
- To explore sustainability and safety improvements through AI integration.

Key Topics Covered

1. **Introduction to AI in Chemical Process Control**
    - Definition and significance of AI in chemical industries.
    - Overview of AI techniques (Machine Learning, Neural Networks, Deep Learning, etc.).
2. **AI for Process Optimization and Automation**
    - AI-driven control systems for enhanced efficiency.
    - Real-time data analysis for process improvement.

   - Case studies showcasing AI-powered optimization.
3. **Predictive Maintenance and Fault Detection**
   - AI models for early fault detection in chemical plants.
   - Reducing downtime through predictive analytics.
4. **AI in Safety and Risk Management**
   - Hazard detection and accident prevention using AI.
   - AI-powered monitoring systems for workplace safety.
5. **Sustainability and Green Chemistry**
   - AI's role in reducing energy consumption and emissions.
   - Smart manufacturing for sustainable chemical production.

Benefits of AI in Chemical Process Control

- **Enhanced Efficiency:** AI-driven automation optimizes chemical processes and improves productivity.
- **Cost Reduction:** AI minimizes operational costs by reducing material waste and energy consumption.
- **Improved Safety:** AI-powered risk management systems prevent hazardous incidents.
- **Quality Assurance:** AI ensures consistent product quality through real-time monitoring.
- **Faster Decision-Making:** AI-driven analytics provide actionable insights for process control.

Challenges in AI Implementation

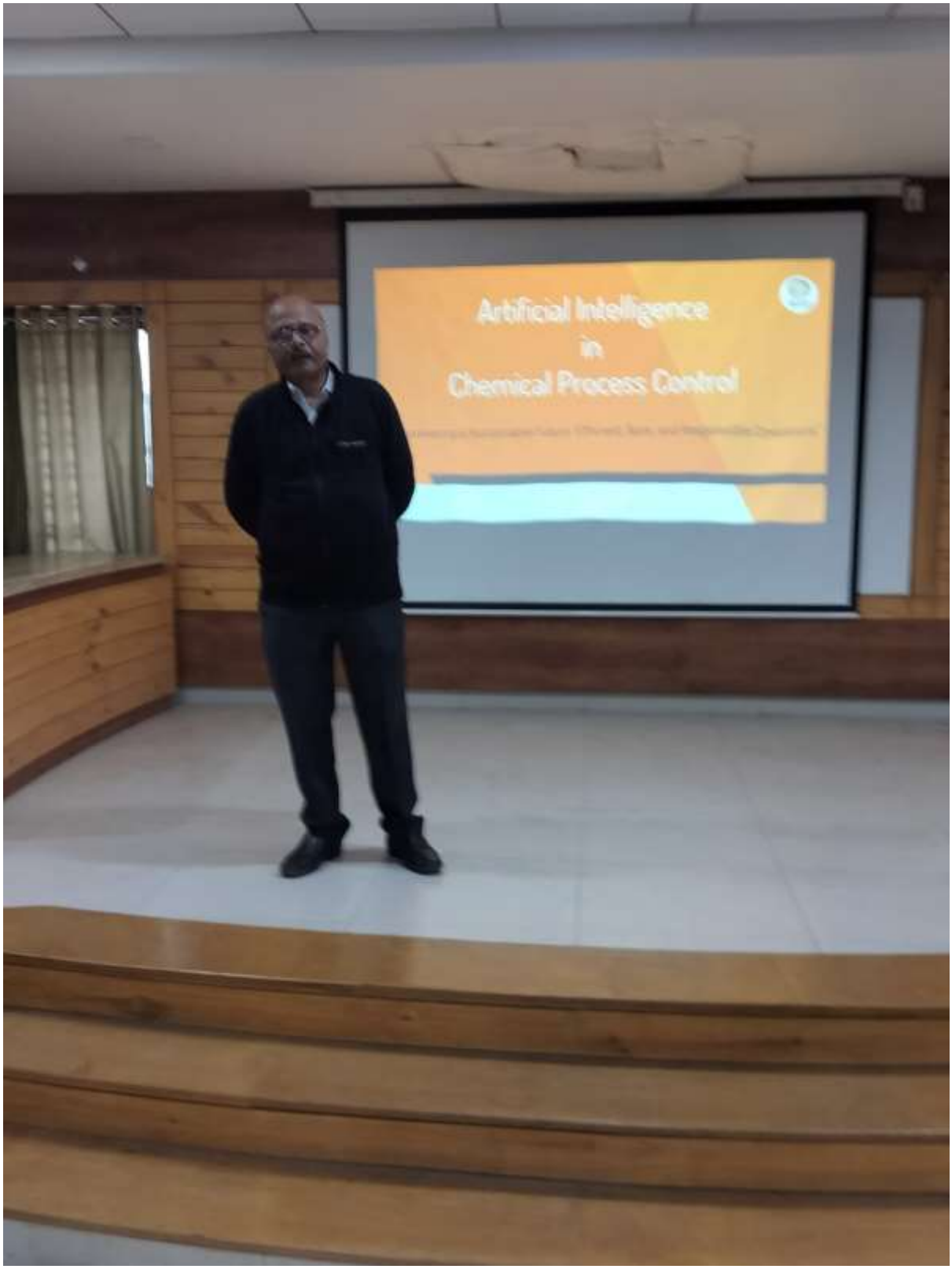
- Integration with existing industrial systems.
- Data security and ethical concerns in AI applications.
- Need for skilled workforce and AI training in the chemical industry.

Conclusion The presentation highlighted how AI is transforming chemical process control by enhancing efficiency, sustainability, and safety. Despite implementation challenges, AI continues to play a crucial role in driving innovation and optimizing industrial processes. The session concluded with an interactive discussion on future AI developments and their potential impact on chemical engineering.

Recommendations

- Encouraging AI research and collaboration with chemical engineers.
- Investment in AI training programs for professionals.

- Adoption of AI-driven solutions for a safer and more sustainable chemical industry.


Artificial Intelligence
in
Chemical Process Control

Artificial Intelligence in Chemical Process Control

Date: 08 Feb. 2025

Dr. S. A. Thakur
Associate Professor in Chemical Engineering

The chemical industry is undergoing a significant transformation with the integration of Artificial Intelligence (AI). Traditional chemical process control systems, reliant on PID controllers, sometimes face challenges in managing complex systems and adapting to disturbances. AI techniques, including machine learning and deep learning, offer robust solutions by effectively handling these complexities. Machine learning enables predictive maintenance, optimizes operating conditions, and detects faults in real-time, while deep learning enhances control strategies through Nonlinear Model Predictive Control (NMPC). The integration of AI leads to increased efficiency, improved safety, and enhanced product quality, ultimately reducing operational costs. With advancements in edge computing and digital twins, the future of AI in process control holds promise for faster response times and better optimization. However, addressing challenges like model interpretability, data security, and ethical considerations is crucial for successful implementation. AI is pivotal in driving the industry's digital transformation toward sustainable practices and will be a game-changer for the industry.