

NAMO-PI4: Nexus for Advanced Modeling and Optimization – AI-driven Modeling in Process Industry 4.0

February 16–20, 2026

Department of Chemical Engineering, NIT Calicut

Organized in collaboration with

NIT Calicut

IIT Kharagpur

Curtin University



Program overview

**Data-to-Dynamics Framework for Advanced
Process Modelling and AI**

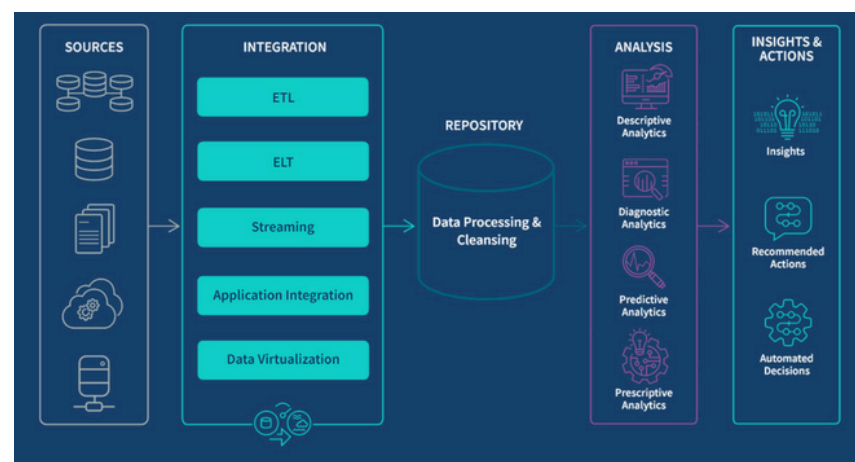
Short-Term Course Date: 16th to 18th Feb 2026

Workshop Date: 19th and 20th Feb 2026

Zero Registration Fee

Target Audience

Undergraduate and postgraduate students of Chemical and Mechanical engineering, along with industry professionals involved in process modelling, optimisation, digitalisation, and AI-driven engineering applications.



Resource Persons

Dr. Ranjeet Utikar

**School of Minerals, Energy and Chemical
Engineering Curtin University**

Organiser

Dr. Subhasis Mandal

**Department of Chemical Engineering
NIT Calicut**

Key Topics

Data-Driven Foundations

Latent Variable Methods

CFD Fundamentals

Nonlinear & ML Models

Advanced Multiphase Flows

Day 1: Data-Driven Modelling • Modelling Landscape: First principles vs. Empirical models. Simulation vs. Prediction. • Data Reality: Handling noise, drift, bias, and missing values. Design of experiments. • Multivariate Analysis: Moving beyond single-variable plots. Correlation and scaling. • Hands-on: Exploratory analysis of real engineering datasets.

Day 2: Latent Variable Methods • Principal Component Analysis (PCA): Geometric interpretation, fault detection, and data compression. • Partial Least Squares (PLS): Regression under collinearity. Interpretation of latent variables. • Hands-on: Building PCA/PLS models for process monitoring. CFD Fundamentals • Governing Equations: Conservation laws and transport phenomena. • Numerical Core: Finite Volume Method, stability, and convergence. • Meshing Mastery: Grid independence and avoiding common pitfalls. • Hands-on: Simulation of single-phase flow systems.

Day 3: Nonlinear & ML Models • Tree-Based Models: Random Forests, Decision Trees, and preventing overfitting. • Model Interpretation: Variable importance and “Black Box” transparency. • Neural Networks: From Perceptrons to Deep Learning basics. • Hands-on: Benchmarking ML against classical latent variable methods. Part 2: Computational Fluid Dynamics, Advanced Multiphase Flows • Multiphase Approaches: Eulerian-Eulerian, VOF, and Particle Tracking. • Closure Models: Drag, turbulence, and scale dependence. • The Frontier: DEM, DNS, and hybrid Physics + Data models. • Hands-on: Eulerian simulation of gas-solid flow.

Aim of the Workshop

The aim of the Workshop on Data-to-Dynamics Framework for Advanced Process Modelling and AI is to provide participants with a comprehensive understanding of how data-driven methods can be systematically integrated with first-principles dynamic models for advanced process analysis, optimization, and control. The workshop seeks to bridge the gap between process data, physical insight, and artificial intelligence, enabling participants to develop robust, interpretable, and scalable modelling frameworks for modern process systems.

About NIT Calicut

National Institute of Technology Calicut was founded as Regional Engineering College, Calicut, in 1961. Set in a picturesque at the foothills of the Western Ghats, it is located about 22 kilometres north-east of Calicut city. It is a prestigious institute with a reputation for excellence at undergraduate, postgraduate and research levels, fostering the spirit of national integration among the students and close interaction with industry.

Expected Outcomes

- Improved understanding of industrial decarbonisation technologies and strategies.
- Identification of key research gaps and scientific challenges.
- Enhanced academia–industry–policy collaboration.
- Actionable insights for future research and policy directions.
- Capacity building of students and early-career researchers.

List of Speakers

1. Dr. Ranjeet Utikar (Curtin University)
2. Dr. Subhasis Mandal (CHED, NITC)
3. Ankur Chatterjee (DGM, GAIL)
4. Dr. Sourav Mondal (CHED, IIT KGP)
5. Dr. Shivanand Kumar Veesam (CHED, NITC)
6. Dr. Panneerselvam Ranganathan (CHED, NITC)
7. Dr. Chandrsekhar Besta (CHED, NITC)
8. Dr. Aniruddha Sanyal (CHED, NITC)
9. Dr. Tamal Pramanick (Math, NITC)
10. Dr. Malladi V. Pavan Kumar (CHED, NITC)
11. Dr. Teja Reddy Vakamalla (CHED, NITC)
12. Dr. Debashish Panda (CHED, NITC)
13. Dr. Dhanya Ram V. (CHED, NITC)
14. Dr. Ashish Soren (CHED, NITC)
15. Ramiseti Lalitha (CHED, IIT KGP)

PATRON

Prof. Prasad Krishna

Director, NIT C

WORK SHOP CHAIR

Dr. Malladi V. Pavan Kumar

HOD, CHED, NIT C

**ZERO
Registration Fee**

Organiser
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Registration link
<https://forms.gle/FSfGg5yx9hbXJAz2A>