Dr. Muhammad Shahid

PhD in Chemical Engineering

(Advanced Process Control, Artificial Intelligence, Machine Learning, Process Modeling & Simulation, Process Control)

Affiliate Member IChemE, Member ACS, Lead Auditor QMS, EnMS, EMS

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14th January 1993

https://scholar.google.com/citations?hl=en&user=Yo6VC4gAAAAJ

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Profile

Chemical Engineer with over eight years of teaching and research experience, specializing in process control, modeling and simulation, soft sensor development, and ML-based fault detection and diagnosis. Skilled in Aspen Plus, Aspen HYSYS, Aspen Plus Dynamics, and Python. Proven track record in teaching core courses, supervising design projects, and contributing to lab and curriculum development. Actively publishing and committed to student-focused, applied engineering education.

Professional Membership

- ✓ Affiliate Member, IChemE (Registration: **200204860**)
- ✓ Graduate Engineer, Board of Engineers Malaysia (Registration: **G2262954A**)
- ✓ Registered Engineer, Pakistan Engineering Council (Registration: **CHEM/14425**)
- ✓ Member, American Chemical Society (ACS) (Registration: **34365485**)
- ✓ Member, The Institute of Engineers Malaysia (Registration: **132575)**
- ✓ Member-Chemical, The Institute of Engineers Pakistan (Registration: **M-21693/KAR-3998)**

Publications

✓ **Journals:**

- **Muhammad Shahid**, H. Zabiri, Syed A. Taqvi. "An embedded KPI-based advisory framework for monitoring and diagnosis of soft sensor degradation" in Results in Engineering (2025), **(IF:7.9)**.
- **Muhammad Shahid**, H. Zabiri, Syed A. Taqvi, M Hai. "Fault root cause analysis using degree of change and mean variable threshold limit in non-linear dynamic distillation column" in Process Safety and Environmental Protection (2024), **(IF: 7.8)**.
- SH Hasnen, **Muhammad Shahid**, H. Zabiri, Syed A. Taqvi. "Semi-supervised adaptive PLS soft-sensor with PCA-based drift correction method for online valuation of NOx emission in industrial water-tube boiler" in Process Safety and Environmental Protection (2023), **(IF:7.8).**
- **Muhammad Shahid**, H. Zabiri, Syed A. Taqvi. "XAI-Powered Multi-Fault Diagnosis in Nonlinear Chemical Systems for Safer, Low-Carbon, and Intelligent Process Operations" in Digital Chemical Engineering **(Under review)**, **(IF: 4.1)**.
- **Muhammad Shahid**, H. Zabiri, Syed A. Taqvi. "A hybrid data-driven soft sensor for real-time NOx emission monitoring in industrial combustion systems using BW-RPLS and XGBOOST residuals correction" in Case Studies in Thermal Engineering, **(Under review)**, **(IF: 6.4)**.
- **Muhammad Shahid**, H. Zabiri, Syed A. Taqvi. "A Smart Multistage KPI and Multiscale PCA–XGBoost Framework for Intelligent Monitoring and Diagnosis of Sensor, Process, and Model Faults in Soft Sensor Monitoring Systems" in Chemical Engineering Science (2025), **(Under review), (IF: 4.3).**

✓ **Conferences:**

- **Muhammad Shahid**, Zabiri. H., Syed A. Taqvi, M. Hai, "Comparative Analysis of Unsupervised Machine Learning Models PCA and Autoencoder with Reconstruction for Fault Detection in Distillation Column, in 2nd MACE Research Symposium, 17/07/2023– 18/07/2023 Kuala Lumpur, Malaysia

Qualification

✓ **Doctor of Philosophy in Chemical Engineering**
Universiti Teknologi PETRONAS, Malaysia (UTP), Malaysia,
Research Title: Development of an Advisory Monitoring and Diagnostic Tool for Soft Sensor Degradation.
Supervisor: AP Ir. Dr. Haslinda Bt Zabiri,
Viva Result: Category 2 (Graduate on Time)
Duration: July 2022 - September 2025

✓ **Master of Engineering in Chemical Engineering**
NED university of Engineering and Technology, Karachi, Pakistan
Major Courses: Advance Process Control, Advanced Heat Transfer, Transport Phenomena, Chemical Engineering Thermodynamics III, Advanced Reaction Engineering.
CGPA: (3.69/4.0)
Duration: July 2017 - November 2018

✓ **Bachelor of Engineering in Chemical Engineering**
University of Karachi, Karachi, Pakistan
Final Year Design Project: Energy, Exergy, Economic & Enviro-Economic (4E) of CO_2 Capture from Natural Gas Using Hybrid Physical & Chemical Solvent. A Simulation Study & Intelligent Modeling.
CGPA: (3.125/4.0)
Duration: January 2011 - December 2015

Professional Experience

✓ **Assistant Professor** **(Feb 2026 – till date)**
Department of Chemical Engineering,
NED University of Engineering & Technology, Pakistan

Taught Courses:
- ✓ Process Modeling and Simulation
- ✓ Process Heat Transfer
- ✓ Chemical Engineering Lab I & III

Software Tutorials:
- ✓ Aspen HYSYS®
- ✓ Aspen EDR

Administrative Responsibilities:
- ✓ Outcome Based Education (OBE) committee member.
- ✓ NEDUET Strategic Plan committee member.
- ✓ NED Experience Magazine committee member, CPE representative.
- ✓ Conducted different seminars on technical knowledge and personal grooming.

✓ **Teaching Assistant** **(July 2022 – Sep 2025)**
Universiti Teknologi PETRONAS, Malaysia

Taught Courses:
- ✓ Process Instrumentation and Control
- ✓ Process Modeling and Simulation
- ✓ Process Heat Transfer
- ✓ Chemical Engineering Lab I & III
- ✓ Organic Chemistry

Software Tutorials:
- ✓ Aspen HYSYS®
- ✓ Symmetry
- ✓ MATLAB® and Simulink

Other Responsibilities:
- ✓ Responsible for carrying out teaching and research duties
- ✓ Preparation of lab manuals and assignments
- ✓ Providing mentoring, advice and support to students on a personal level.

	✓ **Lecturer** **(Feb 2019- Present)** **Department of Chemical Engineering,** **NED University of Engineering & Technology, Pakistan** Taught Courses: • Transport Phenomena • Chemical Process Control. • Chemical Engineering Thermodynamics I & II. • Heat Transfer. Assignments: • Responsible for carrying out teaching and research duties. • Involved in designing new courses and materials. • Involved in the set-up of exams and the marking of results. • Providing mentoring, advice and support to students on a personal level. • Actively leading class discussions and encouraging debate. • Involve in the commissioning of lab equipment. • Project advisor of different projects for final year chemical engineering. Administrative Responsibilities: • Outcome Based Education (OBE) committee member (2019-2022). • Final Year Design Project coordinator of chemical engineering department (2020-2022). • Conducted different seminars on technical knowledge and personal grooming. • Responsible for the departmental administrative tasks.
	✓ **Teaching Assistant** **(July 2017- Dec 2018)** **Department of Chemical Engineering,** **University of Karachi, Pakistan** Taught Courses: • Instrumentation and Control. • Chemical Engineering Thermodynamics II. • Heat Transfer. Assignments: • Responsible for carrying out teaching and research duties. • Involved in the set-up of exams and the marking of results. • Providing mentoring, advice and support to students on a personal level. • Project advisor of different projects for final year chemical engineering. Administrative Responsibilities: • Final Year Design Project committee member of chemical engineering department. • Performing responsibilities as a class advisor for first year chemical engineering. • Responsible for the departmental administrative tasks.
Research Projects	**PhD Research Project** ✓ **Development of an Advisory Monitoring and Diagnostic Tool for Soft Sensor Degradation** This work develops an advisory monitoring and diagnostic tool that detects, separates, and anticipates soft-sensor degradation in real time. The framework blends multivariate statistics and machine learning with Aspen Plus (steady-state) and Aspen Dynamics data to distinguish sensor issues from model and process-induced changes, then turn alarms into clear actions: monitor, recalibration, retrain, or intervene. The result is safer, more reliable operation with soft sensors that stay trustworthy under changing conditions.

Final Year Project (BE Chemical)

✓ **Energy, Exergy, Economic & Enviro-Economic (4E) of CO_2 Capture from Natural Gas Using Hybrid Physical & Chemical Solvent. A Simulation Study.**

- Build and validate an Aspen model of NG CO_2 capture with a hybrid solvent for pipeline specs.
- Quantify energy and exergy: unit duties and exergy-destruction hotspots.
- Evaluate economics and enviro-economics: CAPEX/OPEX, net CO_2, cost, benchmark vs single-solvent.

Training and Certifications

✓ **Certificate:**

- ISO-50001:2018 Energy Management System (Lead Auditor)
- ISO-14001:2015 Environment Management System (Lead Auditor)
- ISO-9001:2015 Quality Management System (Lead Auditor)
- Aspen Certified User in Aspen Shell & Tube Exchanger
- Aspen Certified User in Aspen HYSYS
- Deep Learning with MATLAB
- Simulation-Based Testing with Simulink
- Green and Sustainable Future Fuel Production and Parametric Analysis for High Yield via RSM and ASPEN HYSYS Simulation
- MATLAB onramp

✓ **Internships**

- Novatex Limited. (December 16, 2014, to January 06, 2015)
- Pakistan Council of Scientific & Industrial Research. (July 09, 2014, to July 23, 2014)

Intellectual Property

✓ **Copyrights:**

- [**Muhammad Shahid,** Zabiri. H., Syed A. Taqvi], Embedded Key Performance Indicator-based Advisory Monitoring Index Framework for Soft Sensor Degradation. Filling Number: **LY2025W09114**, MyIPO, Malaysia.
- [**Muhammad Shahid**, Zabiri. H., Syed A. Taqvi], A Multistage KPI and Multiscale PCA-XGBoost Framework for Detection, Segregation, and Diagnosis of Process, Sensor, and Model Faults in Soft Sensor Deterioration. Status: [in submission], [Perak], Malaysia

Software Skills

✓ **Chemical Engineering Software**

- Python ★★★★★★★★★★
- Aspen Plus ★★★★★★★★★★
- Aspen HYSYS® steady state ★★★★★★★★★★
- Aspen Plus ® Dynamics ★★★★★★★★★☆
- Aspen EDR ★★★★★★★★★☆
- MATLAB/ SIMULINK ★★★★★★★☆☆☆

✓ **Office Tools**

- MS Office (Word, Excel, Visio, Power Point) ★★★★★★★★★☆

References

1. **Assoc. Prof. Ir. Dr Haslinda Zabiri**
   Chair, Department of Chemical Engineering,
   Universiti Teknologi PETRONAS
   haslindazabiri@utp.edu.my

2. **Assoc. Prof. Dr. Syed Ali Ammar Taqvi**
   Department of Chemical Engineering,
   NED University of Engineering and Technology
   aliammar@neduet.edu.pk