Zabd Ur Rehman (PhD)

Associate Professor Department of Mechanical Engineering, Air University, AU-AA&C Kamra

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D.O.B:14-01-1989 PEC # Mech/24420

HIGHLIGHTS

- Exceptionally driven individual with a strong desire to expand my knowledge and consistently strive for excellence. Specialization in the field of thermofluids specifically CFD and Heat Transfer.
- Possess a diverse range of experiences, including conducting research, delivering effective teaching, providing supervision and guidance, effectively managing teams, and successfully establishing a mechanical engineering department from inception.
- OBE trained teacher and member of National Curriculum Review Committee.
- Developed and established 15 undergraduate labs
- Regular reviewer of ECM journal

EDUCATION

2013-2018 MS-PhD Integrated Course, Dongguk University, Seoul, South Korea.
Thesis : Experimental Investigation on the Rheology and Flow Characteristics of Tetrafluoroethene Hydrate Slurry

2007-2011 BS, Mechanical Engineering, GIK Institute, Pakistan.

EXPERIENCE

Feb 2026-Present

Associate Professor, Department of Mechanical Engineering, Air University, AU-AA&C Kamra

Jan 2020-Jan 2026

Assistant Professor and Founding Chair Department of Mechanical Engineering, Air University, AU-AA&C Kamra

Main responsibilities are :

- Establishing the department
- Managing the department and all related administrative tasks
- Chair Unfair means committee of the campus
- Superintendent Examination
- Member Departmental Board of studies of Electrical Department
- Teaching Undergraduate and Graduate courses
- Supervising MS students in their thesis work
- Supervising final year projects
- Doing R & D in collaboration with the industry

Sep 2018-Jan 2020

Assistant Professor in Mechanical Engineering Department, University of Wah

Main responsibilities were :

- Teaching Undergraduate and Graduate students that include
- Implementation of outcome Based education System
- Supervising graduate students
- Supervising undergraduate students in Final Year Projects
- Member/secretary of departmental board of studies
- Member/Secretary of Industrial Advisory committee
- Member of Board of faculty of Wah Engineering College

- Member/convener of Departmental Continuous improvement committee
- Member Research Coordination Committee of University of Wah
- President editorial Board of College Magazine
- President Internal Audit Board of University of Wah

March 2013-July 2018

Research Assistant & Teaching Assistant, Dongguk University, South Korea

- **Research Assistant**
  - Thermal Fluids lab
  - Clean Energy research Centre (CERC)
- **Teaching Assistant**
  - Instructor for ADINA software for undergraduate students
  - Fluid Mechanics course assistant

Aug 2011-Feb 2013

Mechanical Engineer, GIK INSTITUTE, Pakistan

- Assisted in the following undergraduate courses
  - Design of machine elements
  - Theory of Machines
  - Manufacturing Technology-I
- Conducted labs of the following courses
  - Dynamics Lab
  - Fluid dynamics Lab
  - Solid Mechanics Lab
- Assisted professors in their research and helped final year students in their FYPs

SKILLS

Teaching	Outcome Based Education (OBE- Washington Accord) trained teacher (Online acquainted)
Research	MCHS, CCS, Non-Newtonian Fluids, Rheological Study, Ejectors, Gas Hydrates, and Machine Learning
Supervision	Actively supervising MS and Undergrad students in thesis and projects
Experiment Design	Design and conduct of experiments
Data Acquisition	Combination of several data types and their integration
Soft wares	Ansys, Solidworks, ADINA, and Pack Office(Word, Excel, PowerPoint).
Soft skills	Adaptable, Team Player, Analytical and critical thinker
Management	Head of the Department

Projects and Supervisions

MS Completed Thesis:

1. "Stress Relieving Using Magnetism by Varying Process Parameters" (Co Supervision Completed MS)
2. "CFD analysis of hypersonic vehicle upon re-entry" (Supervisor, MS Completed)
3. "Effect of Hydrogen injection on the stability of non-premixed Methane/Air flame using Scale Adaptive Simulation" (Supervisor, MS Completed)
4. "Performance Assessment of a Low Bypass Turbofan Engine with Ejector Nozzle" (Supervisor, MS Completed)
5. "Aerodynamic Shape Optimization of Fuselage Body of a High Speed Target Drone" (Supervision, Completed MS)
6. "Experimental Investigation of Surface Integrity and Mechanical Strength of Ti-6Al-4V Titanium Alloy using TIG We lding" (Co Supervision Completed MS)

Projects Supervised:

1. Performance Evaluation, Mathematical modeling and Simulation of Ejector.
2. Desiccant Wheel Design, Fabrication & Economical Analysis of Desiccant Cooler
3. Heat Transfer Enhancement of Heat Sink using Nano fluids for Micro-processor cooling
4. Design and prototype development of RATO launcher

5. Optimization of VAWT using leading edge tubercles
6. PROTOTYPE DEVELOPMENT OF ABSORPTION REFERIGRATION CYCLE USING RENEWABLE ENERGY
7. Investigating the Impact of Balancing Holes on Centrifugal Pump Performance: CFD Simulation and Experimental C orroboration
8. Building Sustainable Communities: A Study of a Stand-Alone off grid PV powered NZE Village for the remote areas of Pakistan.
9. Hybrid Commercial NZEBs: Exploring Feasibility and Material Optimization in Various Climates

JOURNAL PUBLICATIONS

- Muhammad Usman, **Z. Rehman**, K. Seong, S. Lee, and M. H. Song, "In Situ Determination of Solid Fraction from the Measured Hydrate Slurry Flow Rate and Pressure Drop Across Orifice", *Applied Sciences.* **(Published, IF= 2.474**)
- Muhammad Usman, **Z. Rehman**, K. Seong, S. Lee, and M. H. Song " Vacuum Degassing of Aqueous Tetrafluroethane (R134a) Solution During Seawater Desalination Utilizing Gas Hydrate", *Desalination.* **(Published, IF= 7.09)**
- **Z. Rehman** et al. " Revealing the Effects of Microarc Oxidation on the Mechanical and Degradation Properties of Mg-B ased Biodegradable Composites ", *ACS Omega,* https://doi.org/10.1021/acsomega.0c00836 **(Published, IF= 2.584)**
- Hafiz Ali Muhammad, Beomjoon Lee, **Z. Rehman**, Young-Jin Baik " A comprehensive thermodynamic performance assessment of CO_2 liquefaction and pressurization system using a heat pump for carbon capture and storage (CCS) process", *Energy Conversion and Management,* https://doi.org/10.1016/j.enconman.2020.112489 **(Published, IF= 7.181)**
- **Z. Rehman**, K. Seong, S. Lee, and M. H. Song, "Experimental Study on the Rheological Behavior of Tetrafluoroethane (R-134a) Hydrate Slurry," *Chemical Engineering Communications*, doi:10.1080/00986445.2017.1422494 **(Published, IF= 1.431)**
- **Z. Rehman** and K. Seong, "Three-D Numerical Thermal Analysis of Electric Motor with Cooling Jacket," *Energies,* vol. 11, p. 92, 2018, doi :10.3390/en11010092 **(Published, IF= 3.045)**
- **Z. Rehman** et al., "Numerical Modeling of Ejector and Development of Improved Methods for the Design of Ejector Assisted refrigeration system," *Energies.* **(Published, IF= 3.045)**
- **Z. Rehman** et al., "Design and Fabrication of Solar Thermal Energy Storage System Using Potash Alum as a PCM," *Energies.* **(Published, IF= 3.045)**
- **Z. Rehman** et al., "Application of advanced exergy analysis for optimizing the design of carbon dioxide pressurization system," *Energy.* **(Published, IF = 6.08)**
- **Z. Rehman** et al., "Thermo-fluid Characteristics of Microchannel Heat Sink with Multi-configuration NACA 2412 Hydrofoil Ribs," *IEEE ACCESS*. **(Published, IF = 3.36)**
- **Z. Rehman** et al., "Heat transfer augmentation through different jet impingement techniques – A state-of-the-art review," *Energies*. **(Published, IF = 3.004)**
- **Z. Rehman** et al., "Thermal Performance Investigation of Slotted Fin Minichannel Heat Sink for Microprocessor Cooling," *Energies*. **(Published, IF = 3.004)**
- **Z. Rehman** et al., "Minimizing the Casting Defects in High Pressure Die Casting Using Taguchi Analysis," *Scientia Iranica*. **(Published, IF = 1.435)**
- **Z. Rehman** et al., "Effect of Cross-Sectional Geometry on Hydrothermal Behavior of Microchannel Heat Sink," *Journal of Non- Equilibrium Thermodynamics*. **(Published, IF = 3.328)**
- **Z. Rehman** et al., "Comparison of Ground-Based Global Horizontal Irradiance and Direct Normal Irradiance with Satell ite-Based SUNY Model", *Energies*. **(Published, IF = 3.004)**
- **Z. Rehman** et al., "Analysis of Solar PV Technology Adoption in Off-Grid Communities of Khyber Pakhtunkhwa", *IJEW*. **(Published)**
- **Z. Rehman** et al., "Challenges, prospects, and surface chemistry of CuCo2O4 in energy storage, electro-photocatalysis , solar cells, and sensor applications*", J Mater Sci: Mater Electron.* **(Published 2025, IF = 2.9)**
- **Z. Rehman** et al., "Toward cleaner combustion: spray, performance, and emission improvement of castor biodiesel with MoS2 and ABE additives," *Clean Technologies and Environmental Policy* . **(Published 2025, IF = 3.9)**
- **Z. Rehman** et al., "Effect of hydrogen injection on the stability of non-premixed methane/air flame in a gas turbine combustor," *Environmental progress and sustainable energy*. **(Published 2026, IF = 2.3)**
- **Z. Rehman** et al., " A Portable AI-Enabled Intraoral Imaging System for Real-Time Detection and Staging of Dental Caries ," *international journal of imaging systems and technology*. **(Published 2026, IF = 3.0)**
- **Z. Rehman** et al., "Experimental investigation of pressure losses for tetrafluoroethane hydrate slurry flow in pipe fittings," International Journal of Heat and Fluid Flow. **(Published 2026, IF = 4.8)**

Book Chapter

- **Z. Rehman** et al. "Exergoeconomic optimization of binary geothermal power plants", *Thermodynamic Analysis and Optimization of Geothermal Power Plants,* Elsevier, 2020, Ch-19

International Conference Publication

- Hafiz Ali Muhammad, Beomjoon Lee, **Z. Rehman**, Young-Jin Baik, "Investigation of CO_2 liquefaction and pressurization system using Heat Pump", The 6th International Conference of Saving Energy in Refrigeration and Air-Conditioning, Seoul, Korea, 12th - 15th March, 2019.
- **Z. Rehman**, K. Seong, S. Lee, and M. H. Song" Experimental Investigation of Tetrafluoroethane (R-134a) Hydrate Slurry Flow in Pipeline of Complex Configuration", 9th International Conference on Gas Hydrates, Denver, Colorado, 25-27th July,2017. **(Published in Conference Proceedings)**
- Muhammad Usman, **Z. Rehman**, K. Seong, S. Lee, and M. H. Song" Degasification of Aqueous Tetrafluroethane (R-134a) Solution Produced by Hydrate Decomposition during Sea Water Desalination", 9th International Conference on Gas Hydrates, Denver, Colorado, 25-27th July,2017. **(Published in Conference Proceedings)**

Guest / Invited Speaker

- Rheological study of tetreaflouroethane gad hydrate slurry, Delivered in Wah Engineering college on 7th Nov, 2018.
- Application of Natural Gas Hydrates, Delivered on 14th March 2019
- Heat Transfer Assessment of Micro Channel Heat Sinks (MCHS), Delivered in COMSATS Wah on 17th March 2022.

Funded Projects

- RATO launcher (PI , 0.2 Mil PKR)
- Optimization of VAWT using LETs (PI, 0.2 Mil PKR)
- Artificial intelligence based infrared image reconstruction system for condition-based monitoring of mega Structures (PI , Under review)
- Design, development and implementation of robustly controlled active magnetic bearing for integration into clean technologies (Co-PI , Under review)
- Design and Testing of cooling mechanism for AESA Radar

References

1. Prof Seong Kwan Jae (PhD Supervisor)
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2. Prof Sung Myung Ho (Lab Professor)
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   Micronova, Tietotie 3, 02150 Espoo, Finland