

Dr. Safi Ahmed Memon
Ph.D. in Mechanical Engineering (2024)

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EDUCATION

2018.03. – 2024.02. **Kyungpook National University, Daegu, South Korea**

- **Ph.D.** in Mechanical Engineering. Thesis focused on design optimization of heat sinks in *COMSOL Multiphysics*.
- Coursework included advanced engineering mathematics and finite element procedures.

2015.08. – 2017.06. **GIK Institute, Topi, Pakistan**

- **M.S.** in Mechanical Engineering. Thesis focused on developing Nusselt number correlations $Nu(Re,Pr)$ for the phase transformation in cooling channels using *ANSYS Fluent*.
- Coursework included control theory, robotics design, and computations in the heat equation.

2010.08. – 2014.06. **GIK Institute, Topi, Pakistan**

- **B.S.** in Mechanical Engineering. Thesis focused on analyses of bicycle suspensions.

WORK EXPERIENCE

2025.01. – Present **Developing Topology Optimization Algorithms (as an *Independent Researcher*)**
with Wolfram Research, USA – Early Professionals Program

- **Developing algorithms** for topology optimization of fluid flow using functional programming approach.
- The project aims to build accessible multi-physics framework for modeling of coolant-based heat sinks.

2024.03. – 2025.02. **Coupled Differential Equations in Dual-Media Flow (as a *BK21 Postdoctoral Fellow*)**
at Department of Mechanical Engineering, Kyungpook National University, Daegu, Korea

- **Developed algorithms** for coupling of Navier-Stokes and Brinkman PDEs to model interactions between free and porous flows. [Results published on the Wolfram Community](#).
- The project was a collaboration with the *Numerical Computations* team at **Wolfram Research, USA**, and contributes to flow algorithms in future updates of the computational software **Wolfram Mathematica**.

2015.08. – 2018.07. **Graded courses & held computational modeling workshops (as a *Graduate Assistant*)**
at Faculty of Mechanical Engineering, GIK Institute, Topi, Pakistan

- **Conducted workshops** on computational modeling of phase change in *ANSYS Fluent* ([sample workshop](#)) and solving mechanical vibrations problems in *Wolfram Mathematica* ([sample workshop](#))
- **Course grader** for *Heat Transfer (ME333)*, *Fluid Mechanics (ME321)*, *Statics (ME211)*, and *Mechanical Vibrations (ME411)* courses

PROJECTS IN COMPUTATION AND ROBOTICS

Mechanical Design of Award-Winning Robot

- Team member (design) for NightFury – a robot that won the **Best Engineering Design Award** among **170+ teams in Pakistan** at the **National Engineering Robotics Contest, 2012**.
- Full scholarship & travel grant provided by **IEEE Robotics and Automation Society** to travel to their Robotics School in Turkey and present to the worldwide *RoboCup* teams. [Project details](#).

SKILLS

- **Software:**
 - **ANSYS Fluent & COMSOL Multiphysics** (heat transfer & fluid flow simulations)
 - **MATLAB & Wolfram Mathematica** (finite element analysis & neural network modeling)
 - **Creo Parametric** (CAD modeling)
 - **Wolfram System Modeler** (dynamic systems modeling)
 - **Google Sheets** (data analysis)
- **Programming languages:** Wolfram Language, Modelica, Python, Java
- **Research tools:** Scite.ai (for literature search), LitMaps (for identifying research gaps)

PROJECTS IN COMPUTATION AND ROBOTICS (CONTD.)

Intelligent Microcontroller Design in Unmanned Autonomous Vehicle

- Programmed the servo motor using Wolfram Language & Modelica to address the slippage of magnetic bearings in an **autonomous underwater vehicle**.
- The project involved integrating Hall effect sensors with an **Arduino microcontroller** to detect magnetic slippage.

Mathematica App for Assessment of Solar-powered Air Conditioner

- Created user interface in Wolfram Language to input system parameters, such as available solar collector area.
- The program generated plots such as solar collector area vs energy contribution to evaluate system efficiency.

TEACHING AND MENTORSHIP

2018.03. – 2024.02. **Mentored in computational mechanics projects**
as a *Graduate Research Assistant* at Bio & Experimental Fluid Engineering Lab, Daegu, Korea

- Mentored undergraduate students in computational projects in flow analysis and aerodynamics, among others.

2017.08. – 2018.02. **Developed a solar-powered adsorption refrigerator**
as a *Research Assistant* at GIK Institute, Topi, Pakistan

- Led an undergrad student team with the development of a solar-powered adsorption refrigerator for vaccine storage.

AWARDS & RECOGNITION

- **BK21 Postdoctoral Fellowship** awarded by *National Research Foundation of Korea* for 2024 to 2025.
- **Best Researcher Award in 2019 and 2021** for papers in computational fluid dynamics of heat sinks.
- **BK21 Plus Scholarship Recipient** for Fall 2021, Spring 2021, Fall 2020, Fall 2019, Spring 2019, Fall 2018, and Spring 2018; **KNU International Graduate Scholarship Recipient** for Spring 2019, Fall 2019, and Spring 2018.
- Won the **Best Engineering Design Award** among **170+ teams** for a rescue robot design at NERC, Pakistan, 2012.
- Scored in the **top 1.15%** in Pakistan in the **20th International Kangaroo Mathematics Olympiad** (2010.06.)
- Scored **95.56 percentile** in **Mathematics GAT Subject Test**; topics included **calculus, differential equations, linear algebra, mechanics, complex analysis, and probability** (2015.02)

ADDITIONAL INFO

- **Reviewer (with a focus on CFD and FEA-related articles)** for *International Journal of Heat and Mass Transfer* and *Journal of Thermal Sciences*.

Fluid–structure interaction analysis of an ascendable horizontal-bar wastewater screen for enhanced trapping performance

SA Memon, S Akhtar, HB Chae, DW Choi, R Das, CW Park

Water, Vol. 16, No. 24, pp. 3671, **2024**.

2023: **Q1** in *Water Science & Technology*; **IF 3.0**.

DOI: <https://doi.org/10.3390/w16243671>

Hydrostructural phenomena in a wastewater screening channel with an ascendable sub-screen using the arbitrary Lagrangian–Eulerian approach

SA Memon, S Akhtar, HB Chae, DW Choi, CW Park

Applied Sciences, Vol. 14, No. 1, pp. 76, **2024**.

2023: **Q1** in *General Engineering*; **IF 2.5**.

DOI: <https://doi.org/10.3390/app14010076>

Enhancing heat transfer in microchannels: a systematic evaluation of crescent-like fin and wall geometries with secondary flow

SA Memon, S Akhtar, TA Cheema, CW Park

Applied Thermal Engineering, Vol. 239, pp. 122099, **2024**.

2023: **Q1** in *Fluid Flow and Transfer Processes*; **IF 6.1**.

DOI: <https://doi.org/10.1016/j.applthermaleng.2023.122099>

Numerical investigation of solid–liquid dissolution for nutrient mixing improvement in a thin-layer cascade system

S Akhtar, **SA Memon**, S Siddiqa, CW Park

Waste and Biomass Valorization, pp. 1-15, **2023**.

2023: **Q1** in *Environmental Engineering*; **IF 2.6**.

DOI: <https://doi.org/10.1007/s12649-023-02180-x>

Investigation of the hydrothermal phenomena in a wavy microchannel with secondary flow passages through mid-wall inflection points

SA Memon, S Akhtar, TA Cheema, CW Park

Applied Thermal Engineering, Vol. 223, pp. 120010, **2023**.

2023: **Q1** in *Fluid Flow and Transfer Processes*; **IF 6.1**.

DOI: <https://doi.org/10.1016/j.applthermaleng.2023.120010>

Hydrothermal investigation of a microchannel heat sink using secondary flows in trapezoidal and parallel orientations

SA Memon, TA Cheema, GM Kim, CW Park

Energies, Vol. 13, No. 21, pp. 5616, **2020**.

2023: **Q2** in *Renewable Energy, Sustainability and the Environment*; **IF 3.0**.

DOI: <https://doi.org/10.3390/en13215616>

Investigation of the thermal performance of salt hydrate phase change of nanoparticle slurry flow in a microchannel

SA Memon, MB Sajid, MS Malik, A Alquaity, MMU Rehman, TA Cheema, MK Kwak, CW Park

Journal of Chemistry, Vol. 2019, **2019**.

2023: **Q2** in *General Chemistry*; **IF 2.8**.

DOI: <https://doi.org/10.1155/2019/5271923>

PHD THESIS

Enhancement of hydrothermal behavior in a microchannel heat sink including secondary flow

SA Memon

School of Mechanical Engineering, Kyungpook National University, Daegu, South Korea, **2024**.

URL: <https://dcollection.knu.ac.kr/srch/srchDetail/000000106551>

CONFERENCE PRESENTATIONS

Sensitivity in topology optimization of heat sinks for IC chip cooling

SA Memon, CW Park

International Congress of Theoretical and Applied Mechanics (ICTAM 2024), Daegu, Korea, **2024**.

Numerical study on the phase change material applied flow in a microchannel

SA Memon, CW Park

Advances in Functional Materials 2023 (AFM 2023), Fukuoka, Japan, **2023**.

Investigation of thermal performance in microchannels with secondary flow

SA Memon, CW Park

Fall 2021 Conference of the Korean Society of Visualization Information, Busan, Korea, **2021**.

Thermal performance enhancement in a microchannel with secondary flow passage

SA Memon, CW Park

Fall 2020 Conference of the Korean Society of Visualization Information, Gwangju, Korea, **2020**.

Salt hydrate slurry flow characteristics in a microchannel

SA Memon, CW Park

Fall 2018 Conference of the Korean Society of Visualization Information, Busan, Korea, **2018**.

Cooling phenomenon of salt hydrate slurry flow in a microchannel

SA Memon, CW Park

Spring 2018 Conference of the Korean Society of Visualization Information, Seoul, Korea, **2018**.

Numerical study of slurry flow cooling performance with phase change nanoparticles in a microchannel

SA Memon, MB Sajid, MMU Rehman, MS Malik, AS Alquaity

10th Intl. Conference on Computational Heat, Mass and Momentum Transfer, Seoul, Korea, **2017**.