

Safi Ahmed

Ph.D. in Mechanical Engineering

Room 315, Building 6, Bio & Experimental Fluid Engineering Lab,
Department of Mechanical Engineering, Kyungpook National University,
Daegu, South Korea

© +82-10-4363-8413 | safibta@gmail.com
[GitHub](#) | [LinkedIn](#) | [Google Scholar](#)

EDUCATION

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

- **Ph.D.** in Mechanical Engineering. Thesis focused on systematically testing the geometrical attributes of cooling channels. Key findings suggested incorporating wall concavity and smooth flow bifurcation to improve the channel heat dissipation ability.
- Coursework included a finite element analysis course, which involved writing code in Wolfram Language to analyze composite time integration schemes and discussing their dispersion properties.

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

- **M.S.** in Mechanical Engineering. Thesis focused on development of Nusselt number correlations $Nu(Re,Pr)$ for the phase change of salt hydrate slurry in cooling channels.
- Coursework involved in-depth modeling of the heat equation in cylindrical and spherical coordinates, writing code to improve solar panel efficiency, and programming microcontrollers to rectify underwater vehicle wheel slippage.

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

- **B.S.** in Mechanical Engineering. Coursework included analytical and numerical solutions of ordinary and partial differential equations.

WORK AND TEACHING EXPERIENCE

2024.03. – Present **Postdoctoral Researcher**
at Bio & Experimental Fluid Engineering Lab, Daegu, Korea

- Utilizing Wolfram Language to conduct simulations in topology optimization research focusing on 3D-printed heat sinks.
- The project involves using finite element analysis to solve partial differential equations for coolant flow.
- I'm also writing successful proposals for well-funded research projects.

2018.03. – 2024.02. **Supervised computational fluid dynamics projects**
as a *Graduate Research Assistant* at Bio & Experimental Fluid Engineering Lab, Daegu, Korea

- Mentored undergraduate students in computational fluid dynamics projects.
- Projects included analyses of turbulent flow in centrifugal pumps and bullet aerodynamics.

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
- The development process included research, design calculations, and documentation.

2015.08. – 2017.07. **Conducted scientific programming workshops**
as a *Graduate Research Assistant* at GIK Institute, Topi, Pakistan

- Conducted training on solving mechanical vibration problems in Wolfram Mathematica, among others; sample of my workshop: <http://tinyurl.com/safi-mathematica>
- Conducted trainings on CFD modeling of phase change materials in *ANSYS Fluent*; sample of my workshop: <http://tinyurl.com/safi-fluent>
- **Course grader** for *Ordinary Differential Equations*, *Heat Transfer Modeling*, *Fluid Mechanics*, *Statics*, and *Mechanical Vibrations* courses

SCIENTIFIC PROGRAMMING EXPERIENCE

Partial Differential Equations Coupling in Free and Porous Dual-Media Flow

- Developed FEA coding strategies in Wolfram Mathematica to solve fluid flow in complex dual-region structural models. Results published on my Wolfram Community post: <https://community.wolfram.com/web/gkijian/>
- The project was part of the highly selective program **Wolfram Summer School** in 2024; mentored by **Stephen Wolfram** and the lead PDE developers at Wolfram Research, USA.

Intelligent Microcontroller Design to Solve a Bearing Slippage Issue

- 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 Mega microcontroller to detect slippage in the magnetic coupling.

Spherical Heat Equation Visualization for Phase Change Material

- Developed numerical solution code for the heat equation in spherical coordinates to track phase change material interface over 24 hours.
- The code visualizes the series solution of the spherical heat equation over a sphere, depicting temperature profiles of a spherical PCM and its surroundings, with adjustable time control.

Application for Capacity 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 system metrics such as operating temperatures and the percentage of energy demand met by solar power for a specified month.
- The program generated plots such as solar collector area vs energy contribution to evaluate system efficiency.

COMPUTATIONAL SKILLS

- **Software:** Wolfram Mathematica & System Modeler, COMSOL Multiphysics, Ansys Fluent
- **Programming languages:** Wolfram language, Python, Java

PROFESSIONAL DEVELOPMENT

2012.09. **IEEE Robotics Summer School 2012, Alanya, Turkey**

- Full scholarship & travel grant provided upon winning the National Engineering Robotics Contest.
- Collaborated with the *Standard Test Methods for Response Robots* division at *NIST, USA*, to craft a detailed 3D model of earthquake-stricken terrains; presented to the worldwide *RoboCup* teams.

AWARDS & RECOGNITION

- **Best Researcher Award, 2021:** Awarded by *National Research Foundation of Korea* for research on CFD simulation of heat exchangers
- **IEEE-RAS Scholarship Recipient (tuition + travel)** to attend the **IEEE Rescue Robotics Summer School** in Turkey (2012.09.)
- Team member for NightFury – a robot that won the **Best Engineering Design Award** among **170+ teams in Pakistan** at the **National Engineering Robotics Contest, 2012**. Project details: <http://bit.ly/NightFuryRobot>

ADDITIONAL INFO

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

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**.

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**.

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**.

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**.

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**.

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**.

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

Numerical analysis of entropy generation and pressure drop performance of phase change material slurries in microchannels of high heat generating electronic devices

MM Ali, **SA Memon**

Theoretical & Applied Science, Vol. 57, No. 1, pp. 1-8, **2018**.

DOI: <https://doi.org/10.15863/TAS.2018.01.57.1>

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**.