

# 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](mailto:safibta@gmail.com)  
[GitHub](#) | [LinkedIn](#) | [Google Scholar](#)

## EDUCATION

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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.

## SCIENTIFIC PROGRAMMING EXPERIENCE

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### 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/gikiiian/>
- 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.

## WORK AND TEACHING EXPERIENCE

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- 2024.03. – Present      **Conducting topology optimization research in heat transfer**  
as a *Postdoctoral Researcher* at Bio & Experimental Fluid Engineering Lab, Daegu, Korea
- Utilizing Wolfram Language to conduct topology optimization research focusing on 3D-printed heat sinks.
  - The project involves using finite element analysis to solve partial differential equations for coolant flow.
- 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

## COMPUTATIONAL SKILLS

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

## CERTIFICATIONS

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- Certified in “Python for Engineers and Scientists” course, LinkedIn, February 2024
- Certified in “Python Essential Training” course, LinkedIn, February 2024

## AWARDS & RECOGNITION

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- **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>
- Scored in the **top 1.15%** in Pakistan in the **20<sup>th</sup> International Kangaroo Mathematics Olympiad** (2010.06.)
- Scored **770/800** in SAT Subject (Mathematics Level II), 2010.
- 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

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