MD. MEHERAB HOSSEN

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Professional Summary

Mechanical Engineering graduate (AUST, 2026) focused on multiphase CFD and phase-change heat transfer. First author of a journal manuscript under review and co-author of three conference submissions. Experienced in validating Fluent and OpenFOAM models against published benchmarks.

Education

Ahsanullah University of Science and Technology (AUST) **April 2022 – July 2026**
B.Sc. in Mechanical Engineering.
CGPA: 3.122 out of 4.00

Research Interests

Computational Multiphase Flow: Multiphase flow; droplet impact, spreading, and deformation; VOF and interface-capturing methods.
Thermal Transport & Phase Change: Latent heat storage; solid–solid and solid–liquid PCMs; melting and solidification; fin-enhanced heat transfer.

Publications and Conferences

Journal of Energy Storage **October, 2026**
First author, "Numerical Investigation of Enhanced Thermal Energy Storage in Solid-Solid Phase Change Materials with New Fin Architecture for Shell-and-Tube Heat Exchanger Applications", Journal of Energy Storage. Submitted Oct 2026, under review.
Supervisor: Prof. Dr. Dewan Hasan Ahmed.

10th BSME International Conference on Thermo-Fluid Engineering **September, 2026**
Abstract accepted & paper submitted in September 2026.
1. Extending Weber–Ohnesorge Regime Maps to Oblique and Shear-Driven Droplet Impact on UAV Surfaces: A VOF-Based Parametric Study. **First Author**
2. Coupling Pre-Impact Thermal History to Resolved Freezing Dynamics of Free-Falling Supercooled Droplets on UAV-Relevant Cold Surfaces. **Second Author**
3. Thermal Energy Storage Enhancement Using Alphabet-Inspired Fins in a Shell-and-Tube Heat Exchanger with Solid–Liquid PCM. **Third Author**

Research Experience

Undergraduate Research Assistant **2025 – 2026**
Advisor: Dr. Dewan Hasan Ahmed, AUST

- Designed bio-inspired straight fins, placed symmetrically on four sides, for a shell-and-tube solid-solid PCM thermal storage unit.
- Modeled charging and discharging in ANSYS Fluent using temperature-dependent apparent heat capacity (transition at 25 °C). Validated against Farulla et al. [**Plot**] and Alnakeeb et al.[**Plot**] (max deviation 1%), and confirmed grid and time-step independence within 1.57%.
- Compared 5 fin angles and orientations against an unfinned baseline. The best design cut charging time by 79.3%.

Undergraduate Research Assistant — Droplet Dynamics **2026– Present**
Advisor: Nowroze Farhan Ifraj (PhD Student, Mechanical Engineering, Virginia Tech)

- Studied Weber-number effects on spread ratio of free-falling droplets using VOF.
- Reproduced Rafi & Ahmed's falling-droplet cases (Arch. Mech. Eng., 2022) in ANSYS Fluent, with spread ratio error of 3%. [**Plot**]
- Reproduced Goswami and Hardalupas, "Simultaneous impact of droplet pairs on solid surfaces", J. Fluid Mech., 2023 in OpenFOAM, covering We = 54-128, with error of 8% versus published data. [**Plot**] [**Video**]

Professional Experience

CFD Simulation Engineer— Remote
MACPROTEC Houston, Texas, USA **July 2026–Present**

- Analyze industrial dust collectors, baghouses, and process pipelines in ANSYS Fluent, ANSYS Rocky and OpenFOAM.
- Develop 3D geometry in ANSYS DesignModeler and SolidWorks.
- Converted laser scans into CAD geometry using SCENE, CloudCompare, and Geomagic Design X.
- Worked on several simulations setups using DPM for air-coal, air-dust particle transport.

Thesis

"Experimental Characterization of Nymphaea Rubra (Water Lily) Natural Fiber and Its Epoxy Composite through Mechanical Analysis". **July 2026**
Ahsanullah University of Science and Technology (AUST)
Supervisor: Dr. Fazle Rabbi — Three-Member Research Team.

- Investigated water-lily fiber as a sustainable reinforcement for epoxy composites.
- Conducted ASTM-based single-fiber tensile testing using a UTM.
- Best extraction condition: 48-hour retting. Composite tensile strength: 25.5 ± 2 MPa; elastic modulus: 3.2 ± 0.29 GPa; flexural strength: 22 ± 5.5 MPa.

Projects

- **Design of an NACA 23012 Airfoil for a Light Aircraft at Re = 2×10^6.** *Computed lift/drag over -5 to 24 degrees and validated against Miley (1982) wind-tunnel data; developed an airfoil using LE radius, TE gap, maximum camber, and thickness.* ***Tools:*** *XFLR5, MS Excel.* **[Report]**
- **Design of a 50kW Grid-Connected Solar PV Plant with Net Metering, Brahmanbaria** *Sized the array, inverter, and protection scheme; estimated 76,733 kWh annual yield and 3.26-year payback.* **[Report]**
  Tools: *SAM, Global Solar Atlas, LaTeX.*

Industrial Attachment

Bangladesh Industrial Technical Assistance Center (BITAC), Dhaka

- Hands-on training in CNC machining, lathe operation, heat treatment, molding, and casting.

Skills

Simulation & Design:

- *ANSYS Fluent, OpenFOAM, ANSYS Rocky, COMSOL.*
- *FARO SCENE, SolidWorks, Geomagic Design X, Cloud Compare, MeshLab.*

Programming: *C, C++, Python.*
Tools: *MS Word, Excel(Advanced), PowerPoint, LaTeX.*

Awards & Certifications

- **People's Choice Award** — *Mechanical Project Showcasing (Fall 2023)* **[Certificate]**
- **MATLAB Onramp, MathWorks** **[Certificate]**
- **Industrial Attachment Training Program** **[Certificate]**

Reference

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