

MD SOHAIB BIN SARWAR

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Brief Biography

Ph.D. candidate in Mechanical Engineering with a primary research focus on the experimental investigation of dielectric barrier discharge (DBD) plasma–water droplet interactions involving thermofluids, heat transfer, fluid mechanics, and multiphase flow. Research involves integrating experimental diagnostics, data acquisition, and physics-based analysis to characterize complex transient thermal and fluid-dynamic phenomena. Engineering experience includes data-driven engineering analysis, thermal-fluid system modeling, cooling-system design, and experimental validation of laboratory-scale thermal-fluid platforms. Interested in applying this experimental and analytical background to design and develop industrial thermal-management systems, advanced cooling technologies, and innovative thermal products.

Education

Doctor of Philosophy (Ph.D.), Mechanical Engineering

The City College of New York

Aug 2023 – Expected May 2027

New York, NY, USA

- *Dissertation: Experimental Studies of Transient Multiphase Interactions of Droplet Impinging on Surface Dielectric Barrier Discharge (S-DBD) Plasma*

Master of Philosophy (MPhil), Mechanical Engineering

The City College of New York

Aug 2023 – Sep 2026

New York, NY, USA

Awarded en route to Ph.D.

Master of Science (M.Sc.), Renewable Energy Engineering

Coventry University

Sep 2020 – Sep 2021

Coventry, UK

Bachelor of Science (B.Sc.), Mechanical Engineering

Ahsanullah University of Science and Technology

Oct 2015 – Jul 2020

Dhaka, Bangladesh

Professional Experience

Graduate Research Assistant

Jan 2022 – Present

- *The City College of New York*
- *University of South Carolina*
- *South Dakota State University*

Sep 2023 – Present

Aug 2022 – Aug 2023

Jan 2022 – Jul 2022

Graduate Teaching Assistant

Department of Mechanical Engineering, The City College of New York

Aug 2026 – Present

New York, NY, USA

Courses: Heat Transfer; Thermal System Analysis and Design

Adjunct Lecturer

Department of Mechanical Engineering, The City College of New York

Aug 2025 – Dec 2025

New York, NY, USA

Course: Aero-Thermal Fluid

Business Development Executive

ETCBLBS

Feb 2020 – Jul 2020

Bangladesh

Selected Projects

• Controlled Supercooled Droplet Generation and Thermal Characterization

Ph.D. R&D, The City College of New York / DOE Office of Science

Developed and experimentally validated an acoustic-levitation-based cooling platform to control the generation of supercooled water droplets, supporting phase-change research with potential applications in aerospace icing/de-icing and laboratory-scale supercooled-droplet generators. Performed thermal characterization, sensor calibration, and experimental troubleshooting to evaluate transient cooling performance and system repeatability. Separately developed the thermal and mechanical design of a Peltier-based cooling system, including cooling-load calculations, mass and energy balances, insulation design, and thermoelectric-module sizing.

• Spatially Dependent Droplet Impact and Thermal Evolution on S-DBD Plasma

Ph.D. R&D, The City College of New York / DOE Office of Science

Investigated how droplet impact location relative to a surface dielectric barrier discharge (S-DBD) modifies spreading, deformation, directional transport, evaporation, and spatial thermal response. Quantified the coupling between droplet dynamics, plasma location, electrode configuration, and surface-temperature distribution to understand active-surface liquid transport and heat-transfer behavior relevant to thermal-management applications.

- **Sessile Droplet–Plasma Interaction and Branching Dynamics**

Ph.D. R&D, The City College of New York / DOE Office of Science

Investigating plasma-induced deformation, migration, liquid redistribution, branching, and evaporation of sessile droplets to isolate plasma-driven effects from the inertia associated with droplet impact. Evaluating the influence of plasma operating conditions on interfacial instability and liquid transport, with potential applications in active surface control, localized fluid manipulation, and thermal management.

- **Supercooled Droplet Interaction with Surface Dielectric Barrier Discharge Plasma**

Ph.D. R&D, The City College of New York / DOE Office of Science

Investigated the coupled dynamic, thermal, and phase-change response of supercooled water droplets interacting with S-DBD plasma. Characterized plasma-induced changes in spreading, deformation, temperature evolution, nucleation, and freezing to examine the potential of plasma-assisted approaches for aerospace icing/de-icing and phase-change control.

- **HVAC Air-Filtration System Design and CFD Analysis**

M.Sc. Engineering Project, Coventry University, UK

Designed a multi-layer HVAC air-filtration system to improve indoor air quality while considering airflow requirements, filtration efficiency, pressure losses, energy consumption, manufacturability, and cost. Performed computational fluid dynamics (CFD) simulations using STAR-CCM+ to evaluate airflow distributions, velocity fields, and pressure drop, supporting system-level design tradeoff evaluation and integration with air-handling units.

- **Laboratory Wave Generator Redesign and Experimental Validation**

Undergraduate Engineering Project, Ahsanullah University of Science and Technology

Redesigned and reconstructed an existing 16-ft laboratory wave flume to improve periodic-wave generation and experimental repeatability through a piston-type crank wavemaker, modified flume geometry, and improved drive system. Applied SolidWorks CAD, Arduino-based data acquisition (DAQ), ultrasonic sensing, force measurement, and sensor calibration to characterize wave height, force, wavelength, period, and wave-energy behavior against analytical wave theory.

- **Pico-Hydropower System Design and Development**

Engineering Project, Bandarban Hill District Council, Bangladesh

Conducted field reconnaissance and hydraulic assessment of potential run-of-river hydropower sites by evaluating flow rate, velocity, head, channel geometry, seasonal variation, accessibility, and operating constraints. Performed hydraulic and mechanical design calculations and designed and constructed a low-head cross-flow turbine using AutoCAD, an aluminium turbine body, and a 1:15 gear mechanism for generator coupling. *Funded by Bandarban Hill District Council.*

Technical Skills

Experimental Methods & Diagnostics: IR Thermography, High-Speed Imaging, Schlieren Imaging, Sensor Calibration

Instrumentation & Data Acquisition: NI-DAQ Systems, Optical Emission Spectroscopy (OES), Electrical Probes

Data Analysis & Programming: MATLAB (Quantitative Data Analysis, Image Processing)

Simulation: STAR-CCM+, ANSYS

CAD & Engineering Design: SolidWorks, AutoCAD

Energy-System Software: RETScreen, HOMER Pro, windPRO

Selected Publications

Peer-Reviewed Journal Articles

2026 — “Development of a Novel Freezing-Levitation System for Controlled Contact-Free Generation of Supercooled Droplets,” *Journal of Fluids Engineering*, 148(8), 081102.

2025 — “Revealing the Dynamic and Thermal Behaviors of Supercooled Droplet Impinging on Surfaces with Varying Wettability,” *Soft Matter*, 21, 8655–8668.

Peer-Reviewed Conference Proceedings

2026 — “Characterization of Droplet-Plasma Interactions During Droplet Impingement on Surface Dielectric Barrier Discharge Plasma,” *AIAA SciTech Forum*.

2025 — “Dynamics of Supercooled Water Droplet Upon Impacting on Surface Dielectric Barrier Discharge Plasma,” *ASME Fluids Engineering Division Summer Meeting (FEDSM)*.

2025 — “Development of a Novel Freezing-Levitation System for Producing Supercooled Droplet With Precise Control of Supercooling Degrees,” *ASME Fluids Engineering Division Summer Meeting (FEDSM)*.

2024 — “Unveiling the Voltage–Current Characteristics of Dielectric Barrier Discharge Plasma in Interaction with Water Droplets at Varied Temperatures,” *ASME International Mechanical Engineering Congress & Exposition (IMECE)*.

Manuscript Under Review

2026 — “Spatially-Dependent Droplet Impact Dynamics and Thermal Evolution on a Surface Plasma Discharge,” *Transport Phenomena*, under review.

Selected Awards

Mechanical Engineering Service Award, The City College of New York

2026

ASME Fluids Engineering Division Honorary Graduate Student Scholar

2025