

Rohit Kumar, Ph.D.

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Employment History

- May 2025 – till date  **Assistant Professor.** Harcourt Butler Technical University, Nawabganj, Kanpur, Uttar Pradesh.
- January 2025 – April 2025  **Principal Project Scientist.** Department of Mechanical Engineering, Indian Institute of Technology Delhi.
- July 2024 – October 2024  **Early Doc Fellow.** Department of Mechanical Engineering, Indian Institute of Technology Delhi.

Education

- 2018 – 2024  **Ph.D., Mechanical Engineering, Indian Institute of Technology Delhi.**
CGPA: 9.769.
Thesis title: *Computations of phase change flows on curved surfaces using multi-directional interface capturing methods.*
- 2015 – 2017  **M.Tech., Mechanical Engineering, Indian Institute of Technology Guwahati.**
CGPA: 9.34.
Thesis title: *Three-dimensional simulation of gas-liquid flow with and without phase change involving elongated bubble in a microchannel.*
- 2011 – 2015  **B.Tech., Mechanical Engineering.**
CGPA: 9.26.

Research Publications

Journal Articles

- 1 R. Kumar and B. Premachandran, “An insight into the dynamics of film boiling over a cylindrical wire at near-critical pressures,” *Nature Communications (Under Review)*,
- 2 R. Kumar and B. Premachandran, “Mixed convection saturated flow film boiling over an arbitrarily oriented ellipsoid,” *International Journal of Heat and Mass Transfer (Under Review)*,
- 3 R. Kumar and B. Premachandran, “Numerical investigation of flow film condensation over an inline arrangement of two cylinders in the combined natural and forced convection regime,” *International Journal of Heat and Mass Transfer*, vol. 241, p. 126 712, 2025.
- 4 R. Kumar and B. Premachandran, “Flow film boiling on a sphere in the mixed and forced convection regimes,” *Journal of Fluid Mechanics*, vol. 990, A19, 2024.

- 5 S. M. Thamil Kumaran, R. Kumar, and B. Premachandran, "A multi-directional advection based moment of fluid method for phase change problems," *Journal of Computational Physics*, vol. 508, p. 113 011, 2024.
- 6 R. Kumar and B. Premachandran, "A numerical study of saturated pool film boiling over a sphere," *International Communications in Heat and Mass Transfer*, vol. 146, p. 106 897, 2023.
- 7 R. Kumar and B. Premachandran, "A coupled level set and volume of fluid method for three dimensional unstructured polyhedral meshes for boiling flows," *International Journal of Multiphase Flow*, vol. 156, p. 104 207, 2022.

Conference Proceedings

- 1 R. Kumar, S. R. Biswal, and M. K. Padhy, "Modification of the existing setup for sediment erosion in hydraulic turbines," in *International Conference on Hydropower for Sustainable Development*, Feb 05-07, 2015, Dehradun, India.
- 2 R. Kumar and M. Pandey, "Numerical simulation of slug-plug flow in narrow channels of heat pipe," in *44th National FMFP Conference*, Dec 14-16, 2017, Amrita University, Amritapuri Campus, Kollam, Kerala, India.
- 3 R. Kumar and M. Pandey, "Three dimensional simulation of a condensing taylor bubble in a microchannel," in *7th International and 45th National FMFP Conference*, Dec 10-12, 2018, IIT Bombay, India.

Projects

Post-Doctoral

January 2025 – April 2025

- **Modeling and Simulation of Chemical Oxygen Iodine Laser Source:** I was working on an externally sponsored project to develop a laser technology for the generation of a powerful, high-energy laser beam for defense applications. Firstly, singlet oxygen is generated through a chemical reaction between hydrogen peroxide and chlorine. Thereafter, the process involves mixing singlet oxygen with iodine vapor, passing the mixture through a supersonic nozzle, and then expanding it into a laser cavity to achieve lasing.

Doctoral

- **Project details:** Throughout my PhD research work, I primarily focused on the advancement of computational methods for the numerical modeling of multiphase flows. I contributed to the advancement of both the multi-directional Volume of Fluid approach and the Moment of Fluid method to enhance interface capturing on a fixed Eulerian grid. The result of the PhD research was an in-house finite volume solver for two-phase flows on 3D unstructured polyhedral meshes. The in-house code was parallelized using MPI to operate on the distributed memory architecture of the institute's HPC facility.

Masters

- **Project details:** The research primarily concentrated on simulating two-phase flows in a trapezoidal microchannel utilizing ANSYS-Fluent and OpenFOAM.

Honors and Awards

2024  Paper accepted for cover page article in the *Journal of Fluid Mechanics* (Volume 990)



2025  Awarded a distinction in doctoral research by the Indian Institute of Technology Delhi

Technical skills

Programming languages  C, C++, Python, Latex.
Softwares  ANSYS Fluent, ANSYS SpaceClaim, ICEM CFD, SolidWorks, OpenFOAM, STAR-CCM+.

Research Interests

 Direct numerical simulation of two-phase flows, Multiphase flow, Phase Change, Computational fluid dynamics and heat transfer, Numerical methods, Turbulent flows, High Performance Computing