

Shubham Goswami

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CURRICULUM VITAE

RESEARCH INTERESTS

Computational Fluid Dynamics, Non-Linear Dynamics, Modal Decomposition, Aero/Hydrodynamics, Turbulence, Fluid-Structure Interaction, Multiphase Flows, Heat Transfer, and Renewable Energy.

EDUCATION AND TRAINING

PHD - MECHANICAL ENGINEERING

UNIVERSITY OF ALBERTA, EDMONTON, AB, CANADA

JAN 2021 - JAN 2025

M.SC. - MECHANICAL ENGINEERING

UNIVERSITY OF ALBERTA, EDMONTON, AB, CANADA

SEPT 2018 - SEPT 2020

B.TECH. - MECHANICAL ENGINEERING

VIT UNIVERSITY, VELLORE, TN, INDIA

JUNE 2014 - JUNE 2018

RESEARCH EXPERIENCE

POSTDOCTORAL ASSOCIATE

UNIVERSITY OF CALGARY

FEB 2025 – PRESENT

- Developing advanced numerical models to detect and analyze combustion instabilities in hydrogen burners, with a focus on enabling efficient and reliable hydrogen-based energy systems.
- This work contributes to the decarbonization of the energy sector in Alberta, supporting the transition to a sustainable, low-carbon future.

RESEARCH ASSISTANT - PHD CANDIDATE

UNIVERSITY OF ALBERTA

JAN 2021 – JAN 2025

- Thesis Title: **Wake transitions and interactions behind wall-mounted bluff bodies.**
- Study of bluff body wakes, vortex dynamics and vortex interactions using Computational Fluid Dynamics (CFD).
- Expertise in Direct Numerical Simulations (DNS) and Large Eddy Simulations (LES).
- Software: OpenFOAM, ANSYS, COMSOL Multiphysics, Python, MATLAB, Tecplot, and ParaView.

RESEARCH ASSOCIATE

UNIVERSITY OF ALBERTA

SEPT 2020 – DEC 2020

- Research Topic: **Response of Viscoelastic turbulent pipeflow past square bar roughness.**
- Performed CFD simulations of non-Newtonian, Viscoelastic and turbulent flow inside a pipe with a roughness element using Ansys, OpenFOAM.
- Expertise in modeling non-Newtonian and viscoelastic fluid flow using Direct Numerical Simulations in OpenFOAM.

RESEARCH ASSISTANT - M.SC. CANDIDATE

UNIVERSITY OF ALBERTA

SEPT 2018 – SEPT 2020

- Thesis Title: **Response and Recovery of turbulent pipeflow past squarebar roughness elements.**
- Completed study on pipeflow dynamics using Computational Fluid Dynamics.
- Expertise in Reynolds-Averaged Navier-Stokes (RANS) based turbulence modeling and Direct Numerical Simulations (DNS).
- Software: OpenFOAM, ANSYS, MATLAB, Tecplot, and ParaView.

PUBLICATIONS

JOURNAL PUBLICATIONS

MANUSCRIPTS UNDER REVIEW

- **Goswami, S.**, Hemmati A. (2025). Destabilization of leading-edge shear-layer behind wall-mounted long prisms. *Journal of Fluid Mechanics* (Under Review, December 2024)

ACCEPTED & PUBLISHED MANUSCRIPTS

- Shojaei A. S., **Goswami, S.**, Lange C., and Hemmati A. (2025). A Neural Network approach to improve Reynolds Averaged Navier-Stokes modeling of bluff body wakes. *AIP Advances* (Accepted, January 2025)
- **Goswami, S.**, Hemmati A. (2024). Influence of depth-ratio on turbulence transition in the wake of wall-mounted prisms. *Journal of Fluid Mechanics* (Accepted, November 2024)
- **Goswami, S.**, Hemmati A. (2024). Impact of depth-ratio on shear-layer dynamics and wake interactions around wall-mounted prisms. *Physics of Fluids*, 36(11).
- **Goswami, S.**, Hemmati, A. (2023). Mean wake evolution behind low aspect-ratio wall-mounted finite prisms. *International Journal of Heat and Fluid Flow*, 104, 109237.
- **Goswami, S.**, Hemmati, A. (2022). Mechanisms of wake asymmetry and secondary structures behind low aspect-ratio wall-mounted prisms. *Journal of Fluid Mechanics*, 950, A31.
- Zargar A, **Goswami, S.**, Hemmati A. (2022). On the wake of a large depth ratio wall-mounted prism at a normal incident angle. *Journal of Wind Engineering and Industrial Aerodynamics*, 230, 105168.
- **Goswami, S.**, Hemmati, A. (2021). Response of viscoelastic turbulent pipeflow past square bar roughness: the effect on mean flow. *Computation*, 9(8), 85.
- **Goswami, S.**, Hemmati, A. (2021). Evolution of turbulent pipe flow recovery over a square bar roughness element at a range of Reynolds numbers. *Physics of Fluids*, 33(3), 035113.
- **Goswami, S.**, Hemmati, A. (2020). Response of turbulent pipeflow to multiple square bar roughness elements at high Reynolds number. *Physics of Fluids*, 32(7), 075110.

THESIS

- **Goswami, S.** (2025). Wake transitions and interactions behind wall-mounted prisms, PhD Thesis, University of Alberta, Edmonton, AB.
- **Goswami, S.** (2020). Response and Recovery of turbulent pipeflow past squarebar roughness elements, MSc Thesis, University of Alberta, Edmonton, AB.

CONFERENCES

REFEREED CONFERENCE PAPERS

- **Goswami, S.**, Hemmati A. (2024). Transition-to-Turbulence in the Wake of Wall-Mounted Prisms: Insights from Moderate Reynolds Numbers. Thirteenth International Symposium on Turbulence and Shear Flow Phenomena (TSFP13), Montréal, Canada.

CONFERENCE PRESENTATIONS

- **Goswami, S.**, Hemmati A. (2024). Transition-to-Turbulence in the Wake of Wall-Mounted Prisms: Insights from Moderate Reynolds Numbers. Thirteenth International Symposium on Turbulence and Shear Flow Phenomena (TSFP13), Montréal, Canada.
- **Goswami, S.**, Hemmati A. (2023). The mechanism of unsteady wake transition behind large depth-ratio wall-mounted prisms. 76th Annual Meeting of the American Physics Society (APS) Division of Fluid Dynamics, Washington, DC, USA.
- **Goswami, S.**, Hemmati A. (2022). Mean wake transitions of wall mounted long prisms at low Reynolds numbers. 75th Annual Meeting of the American Physics Society (APS) Division of Fluid Dynamics, Indianapolis, IN, USA.

- **Goswami, S.**, Hemmati A. (2022). Secondary structures in the axisymmetric wake behind of low aspect-ratio wall-mounted prisms, 14th European Fluid Mechanics Conference, Athens, Greece.
- **Goswami, S.**, Hemmati, A. (2022). On the wake axisymmetry and secondary structures behind low aspect-ratio wall-mounted prisms. 2022 Canadian Society of Mechanical Engineering (CSME) International Congress, Edmonton, AB, Canada.
- **Goswami, S.**, Hemmati A. (2020). Recovery of viscoelastic turbulent pipeflow past square bar roughness. 73rd Annual Meeting of the American Physics Society (APS) Division of Fluid Dynamics, Chicago, IL, USA.

TEACHING EXPERIENCE

FINITE ELEMENT METHOD FOR MECHANICAL ENGINEERING (MECE 563)

LAB INSTRUCTOR

MAY 2022 - DEC 2024

- Led seminars on solving engineering problems using ANSYS APDL and Mechanical Workbench.
- Guided students in assignments and projects, enhancing their application of engineering concepts.

APPLIED COMPUTATIONAL FLUID DYNAMICS (MECE 539)

LAB INSTRUCTOR

JAN 2022 - APR 2022

- Delivered hands-on seminars using commercial CFD codes (ANSYS CFX, STAR-CCM+), focusing on setup, analysis, and theoretical applications.
- Assisted students in projects, strengthening their practical CFD skills.

MECHANICAL ENGINEERING LAB I (MECE 301)

LAB INSTRUCTOR

JAN 2020 - AUG 2024

- Instructed on mechanical engineering measurement techniques and data analysis.
- Provided guidance on experimental methods and report writing for professional development.

WORK EXPERIENCE

LABORATORY ADMINISTRATOR

COMPUTATIONAL FLUID ENGINEERING LABORATORY, UNIVERSITY OF ALBERTA

JAN 2022 – AUG 2024

- Spearheaded the design and deployment of three high-performance computing (HPC) workstations, improving computational efficiency for cutting-edge research projects.
- Led a team of researchers and technicians in maintaining and upgrading computational resources, fostering a collaborative and productive research environment.
- Successfully **secured approximately \$200k in funding** (\$102,748 in 2023, \$91,605 in 2024) for the laboratory through effective grant writing and proposal leadership.
- Mentored graduate students in utilizing HPC infrastructure for advanced simulations, enhancing their technical skills and project outcomes.
- Demonstrated comprehensive knowledge of Linux, Windows, and MacOS operating systems while managing and troubleshooting complex HPC clusters and workstations.

ENGINEERING RESEARCH SAFETY ASSOCIATE

DEPT. OF MECHANICAL ENGINEERING, UNIVERSITY OF ALBERTA

AUG 2021 – AUG 2024

- Led the development and implementation of safety protocols for various engineering research projects, ensuring strict compliance with institutional and HSE guidelines.
- Organized and **facilitated safety training workshops**, mentoring over 50 researchers, ensuring adherence to best safety practices in research activities.
- Conducted regular **safety audits and risk assessments**, collaborating with faculty and students to identify hazards and implement risk mitigation strategies.
- Coordinated with **cross-disciplinary research teams** to integrate safety into project planning and execution, promoting a proactive safety culture within the department.
- Compiled comprehensive safety reports, contributing to the university's safety record and ensuring compliance with regulatory bodies.

- Led the completion of complex simulation projects, including proof-of-concept analysis involving **multiphysics simulations** (flow, heat transfer, structural integrity).
- Developed a novel **CFD-based Data-Center Cooling System** for a client’s GPU cluster, leveraging cutting-edge numerical techniques for optimized thermal management.
- Managed a cross-functional team of engineers and researchers to address **complex conjugate heat transfer, extreme temperature, and solar radiation** challenges.
- Delivered client presentations and technical reports, translating simulation results into actionable insights for engineering and operational improvements.
- Mentored junior engineers and graduate students in CFD methodologies, contributing to the development of their simulation skills and professional growth.

CONFERENCE PARTICIPATION & INVITES

TURBULENCE AND SHEAR FLOW PHENOMENA (TSFP13)	2024
AMERICAN PHYSICS SOCIETY (APS) DIVISION OF FLUID DYNAMICS (DFD)	2020 - 2023
EUROPEAN FLUID MECHANICS CONFERENCE (EFMC)	2022
CANADIAN SOCIETY OF MECHANICAL ENGINEERING (CSME) INTERNATIONAL CONGRESS	2022