FULLY-FUNDED PHD STUDENTSHIP - FLUID DYNAMICS

Title: Heat transfer effect on nonlinear disturbances in transitional boundary layers

School of Mechanical, Aerospace and Civil Engineering

The University of Sheffield, UK

Topic of research: The transition of boundary layers from the laminar to the turbulent regime is one of the most challenging topics in classical physics and applied mathematics, and stands as a bottleneck problem in the modern flow engineering technology. Major issues are the undesired increase of wall friction and wall-heat transfer when the flow becomes turbulent, which impacts directly on the performance of vehicles and on the efficiency of machinery because of the energy losses in boundary layers. It is therefore desirable to predict the occurrence of transition to turbulence and suppress the unstable disturbances in boundary layers that lead to transition.

In this project, the central objective is to utilise wall-heat transfer (cooling/heating) to stabilise the boundary layer and obtain a delay of transition to turbulence. The effect of external agents, such as free-stream disturbances and wall roughness, will also be taken into account. The methodology of the research is theoretical, based on matched asymptotic analysis and other perturbation methods, and numerical, i.e. an existing in-house code will be modified to achieve the objectives.

This project offers the unique opportunity to develop strong skills in viscous fluid mechanics, numerical methods and applied mathematics. The research project will be supervised by Prof. Pierre Ricco.

Start date: October 2025.

Duration: 3.5 years.

Nationality The studentship is available to UK citizens.

Education A strong 4-year degree or MSc degree in Mechanical, Aeronautical, Civil, Chemical Engineering, Applied Mathematics or Physics.

Knowledge, skills

Fluid mechanics; desirable: wall-bounded shear flows, aerodynamics.

Numerical analysis, in particular Computational Fluid Dynamics.

Excellent programming skills in C, Fortran, or any other high-level language.

Desirable: final-year project on a fluid mechanics problem.

Other requirements

Unique self-motivation and passion for research in fluid mechanics.

Excellent communication of research results and writing skills.

Deadline: Monday 5th May 2025.

APPLY HERE

Queries and CVs/covering letters can be directed to the supervisor:

Pierre Ricco
Professor of Fluid Mechanics
School of Mechanical, Aerospace and Civil Engineering,
The University of Sheffield
Email: p.ricco@sheffield.ac.uk