

Future Fluid Dynamics

Research Internship Programme



Candidate brief

Numerical modelling of dynamic wetting in extrusion-based coating of ceramics

Numerical modelling of dynamic wetting in extrusion-based coating of ceramics

Project supervisors: Dr Masoud Jabbari, Dr Mark Wilson
Department: School of Mechanical Engineering

Duration: 6 weeks FT (or PT equivalent)
Start date: June 2025
Stipend: £3,517
Location: University of Leeds campus

Project summary

Dynamic wetting in general captures the movement of a liquid contact line on a solid surface, and it is mostly governed by balance between surface tension, viscous forces, and inertia. Modelling of dynamic wetting in extrusion-based ceramic coating processes involves simulating the interaction between a liquid phase (ceramic paste) and a moving substrate. This is a critical area in coating technology that influences uniformity, adhesion, and the final quality.

The aim of this project is to model two-phase flow (ceramic and air) during coating process by solving governing equations including mass conservation, momentum conservation with appropriate boundary condition (slip/no-slip/Navier slip) at the substrate as well as dynamic contact angle model accounting for substrate speed and surface roughness.

Developmental benefits

- Proficiency in modelling tools like Ansys or OpenFOAM
- Understanding of advanced numerical methods such as volume-of-fluid (VOF) for interface tracking of two immiscible flows
- Setting up complex boundary conditions for wetting and coating phenomena
- Gaining insights into ceramic properties and how they affect wetting behaviour
- Learning about ceramic coating processes and their importance in future technologies
- Understanding how to interpret simulation data to optimise real-world processes

Essential criteria

Applicants to this project should have:

- Knowledge of fluid flow
- Some experience with CFD modelling platform (e.g. Ansys or OpenFOAM); although experience with those modelling platforms is desirable, it is not essential.
- Aptitude for computational work.
- Critical thinking and effective communication skills.
- Willingness to learn new techniques, tools, and theories

Who should apply

On order to be considered for this opportunity, applicants must be eligible for the **Home (UK) rate of postgraduate academic fees**, must **not** have previously undertaken a research internship with the Leeds Centre for Doctoral Training in Future Fluid Dynamics **and meet one or more** of the below criteria:

- First in family to go to university
- From a Black, Asian or other minoritised ethnic group
- Neurodivergent (e.g. ASD, ADHD) and/or Disability (e.g. physical impairments, mental health condition, learning difficulties, chronic illness)
- Identify as female
- Have caring responsibilities
- Have been outside of education for 5 or more years
- Studying/studied at a university that is not a member of the Russell Group*

If you have any questions or would like to discuss your eligibility, please contact pgrdiversity@leeds.ac.uk

How to apply

Before making an application, you should review the essential and eligibility criteria above. Please note that if you do not meet the stated eligibility criteria your application will not be shared with the shortlisting panel for review.

You can submit your application by completing the form below:

[Future Fluid Dynamics Internship Programme \(2025\): Application form](#)

Applications close at 23:59 on Friday 31 January 2025.

If you have any questions about your application, please contact Emily Bryan-Kinns by email at e.bryan-kinns@leeds.ac.uk.

If you require information for disabled applicants, or would like to request alternative formats, please contact the PGR Diversity Team by email at pgrdiversity@leeds.ac.uk.