Information on Postgraduate Research Scholarship
Ref: FS-ES-04-2027-11

Faculty:	Engineering & Science	**School:**	Engineering
Lead Supervisor:	Dr Samueal Mengistu		
Project Title:	A Novel DEM-Based Framework for Quantitative Prediction of Wear in Bulk Solids Handling Equipment		
Project Description:	Bulk solids such as sand, cement, coal, biomass, and ores account for approximately 70% of all industrial raw materials. In the UK alone, more than 84 million tonnes of dry bulk solids were transported through major ports in 2023 (Department for Transport, 2024). Many of these materials are highly abrasive, causing significant wear in bulk solids handling (BSH) equipment such as chutes, hoppers, silos, and conveyors. This wear results in substantial economic losses due to downtime, maintenance, and component replacement, as well as environmental consequences from dust emissions and material waste. Effective wear mitigation in BSH systems is therefore crucial for enhancing industrial efficiency, reducing costs, and promoting environmental sustainability. Traditional investigations of wear have relied heavily on experimental testing to understand material degradation mechanisms. While valuable, these approaches are often expensive, time-consuming, and limited in scalability. Computational techniques, particularly the Discrete Element Method (DEM), offer a powerful alternative for predicting and analysing wear behaviour. However, for DEM models to provide reliable quantitative predictions, they must accurately represent complex wear mechanisms and be supported by comprehensive experimental validation. Building on a novel DEM-based wear model developed at the University of Edinburgh (an existing collaborator), this project proposes to develop an integrated simulation methodology for quantitative evaluation of wear in BSH equipment. The model will incorporate progressive surface evolution and capture realistic wear mechanisms, including impact, sliding, and scratching, under industrially relevant conditions. A significant research gap remains in understanding particle–surface interactions, the scarcity of high-quality experimental data for model validation, and the limited integration between laboratory-scale observations and full-scale industrial operations. This research aims to bridge these gaps by establishing a combined experimental–computational framework for accurate wear prediction and optimisation in BSH applications. Aim: To develop and validate a practical DEM-based wear prediction model for bulk solids handling equipment, supporting low-maintenance and energy-efficient industrial operations. Objectives: 1. Characterise abrasive solids (e.g., sand) to understand the influence of particle size, shape, density, and hardness on wear behaviour.		

	2. Characterise equipment materials (e.g., mild steel) to define surface and mechanical properties relevant to wear. 3. Conduct experimental wear studies under controlled and pilot-scale conditions using existing test facilities. 4. Integrate and calibrate DEM parameters with experimental data to enhance model fidelity. 5. Validate the DEM model through comparison with wear data from practical systems such as pneumatic conveyors. The research will utilise the existing facilities at the Wolfson Centre, including centrifugal erosion testers, rubber wheel abrasion testers, and pilot-scale pneumatic conveyors. Experimental results will directly inform and validate the DEM framework, extending its applicability to ductile wear mechanisms observed in industrial chutes and conveyors. The expected outcome is a validated wear prediction and optimisation tool that enables industry to design longer-lasting, more efficient handling systems. The project will contribute to reduced maintenance and energy costs, lower material waste, and improved sustainability across bulk solids industries. It will also strengthen the ongoing collaboration between the Universities of Greenwich and Edinburgh, supporting future joint research and external funding applications.
Duration:	3 years, full-time study 6 years, part-time study

Support available (subject to satisfactory performance):

For Home students

- A full tuition fee waiver at the Home student rate for the duration of the scholarship.

For International students

- 50% tuition fee waiver against the International student rate for the duration of the scholarship.

Important information

- Tuition fees are subject to annual review and may increase during the course of study.
- This scholarship covers tuition fees only and does not include funding for living, accommodation, or maintenance costs.

Person Specification of Essential (E) or Desirable (D) requirements:

Criteria:	**E or D**
Education and Training:	
• 1st Class or 2nd class, First Division (Upper Second Class) honours degree or a taught master's degree with a minimum average of 60% in all areas of assessment (UK or UK equivalent) in a relevant area to the proposed research project	**E**
• For those whose first language is not English and/or if from a country where English is not the majority spoken language (as recognised by the UKBA), a language proficiency score of at least IELTS 6.5 (in all elements of the test) or an equivalent UK VISA and Immigration secure English Language Test is required, if your programme falls within the faculty of Engineering and Science a language proficiency score of at least IELTS 6.5 overall with a	**E**

minimum of 6.0 in all elements of the test or an equivalent UK VISA and Immigration secure English Language Test is required. Unless the degree above was taught in English **and** obtained in a majority English speaking country, e.g. UK, USA, Australia, New Zealand, etc, as recognised by the UKBA.	
Experience & Skills:	
• Previous experience of undertaking research (e.g. undergraduate or taught master's dissertation)	**E**
Personal Attributes:	
• Understands the fundamental differences between a taught degree and a research degree in terms of approach and personal discipline/motivation	**E**
• Able to, under guidance, complete independent work successfully	**E**
Other Requirements:	
• This scholarship may require Academic Technology Approval Scheme approval for the successful candidate if from outside of the EU/EEA	**E**
• The scholarship must commence before 5th April 2027	**E**
Closing date for applications:	**Midnight UTC on 30th November 2026**
For further information contact:	**Dr Samueal Mengistu;** **Email: s.mengistu@greenwich.ac.uk**

Making an application:

Please read this information before making an application. Information on the application process is available at: https://www.gre.ac.uk/research/study/apply/application-process. Applications need to be made online via this link. **No other form of application will be considered**.

All applications **must include** the following information. **Applications not containing these documents will not be considered.**

- **Scholarship Reference Number (FS-ES-04-2027-11)**– included in the personal statement section together with your personal statement as to why you are applying
- **a CV including 2 referees** *
- **academic qualification certificates/transcripts and IELTs/English Language certificate if you are an international applicant, if English is not your first language or you are from a country where English is not the majority spoken language as defined by the UK Border Agency** *

**upload to the qualification section of the application form. Attachments must be a PDF format.*

Before submitting your application, you are encouraged to liaise with the Lead Supervisor on the details above.