Engineering and Physical Sciences Research Council

Brunel University of London

1 (a) Title: Dr Surname: Ercolino First name and middle initials: Marianna

(b) Department name: Engineering

(c) Have you supervised Vacation Internships before?

No

RESEARCH PROJECT

2 (a) Title of project: (no more than 220 characters)

Development of Conductive Repair Materials and Design of Repair Solutions Using Construction Waste

(b) Description of the proposed project (no more than 700 words) outlining:

i) Background to the project;
ii) Aims and objectives. Any key hypotheses to be tested or questions to be asked. What you hope to achieve during the period of research;
iii) Methods experimental design and methods;
iv) Brief outline of a timetable of work.
Please note that continuation of undergraduate projects will not be considered.

Engineering and Physical Sciences Research Council

Brunel University of London

Background to the Project

The proposed undergraduate research project will support the ongoing **DRIFT** research project (**P21863 C13524 DRIFT – Start date: 01/12/2025**) funded through Innovate UK and Eureka under the 2024 call "Disaster Resilience, Response and Recovery." Dr Ercolino is the PI at Brunel University as well as the coordination of the international consortium, which brings together academic and industrial partners from the UK, Turkey, and South Korea, with a total consortium budget of approximately £1.3 million. The project aims to deliver an innovative, technology-based service that enables faster and more robust pre- and post-earthquake assessment of buildings. Within DRIFT, Work Package 4 (WP4) focuses on identifying and assessing suitable retrofitting materials and intervention approaches for existing structures. Current challenges include limited comparative assessment of material performance, uncertainty regarding retrofit efficiency for different structural forms, and the lack of streamlined methodologies for evaluating retrofit options at early design stages.
This undergraduate internship will contribute specifically to WP4 Task 1 by supporting a comprehensive literature review and preliminary numerical assessment of retrofitting strategies. The student will gain research experience in sustainable infrastructure, engineering assessment methods, and data-driven evaluation techniques while contributing directly to an active research programme.

Aims and Objectives

The overall aim of the project is to support the development of evidence-based retrofit assessment methodologies for existing structures within the DRIFT project.
The objectives are:

1. To undertake a structured literature review on current retrofitting materials, techniques, and assessment methodologies for structural rehabilitation and sustainability improvement.
2. To identify and compare suitable retrofit materials based on criteria including structural performance, embodied carbon, durability, constructability, and cost.
3. To investigate methods for estimating structural volume and material quantities relevant to retrofit interventions.

Key research questions include:

- Which retrofit materials and approaches demonstrate the best balance between structural performance and environmental sustainability?
- How can simplified numerical assessments support early-stage retrofit decision-making?

During the internship period, the student is expected to produce a literature review summary, comparative assessment tables, preliminary numerical analyses, and recommendations that will directly inform WP4 activities within DRIFT.

Methods, Experimental Design and Methods

The project will primarily involve desk-based research, numerical analysis, and engineering assessment methods. The student will begin with a systematic literature review using academic databases, technical guidance documents, and recent research publications related to structural retrofitting, low-carbon materials, and rehabilitation techniques. The literature review will be organised according to retrofit type, material category, structural application, and sustainability metrics. Following the review stage, the student will assist in identifying representative structural case studies and retrofit scenarios. Preliminary engineering calculations will be undertaken to estimate structural volumes, material quantities, and comparative retrofit implications for selected intervention strategies.
The project will be supervised through regular weekly meetings, with guidance provided on research methods, engineering calculations, and academic reporting.

Brief Outline of Timetable of Work

<u>Weeks 1–2</u>

- Introduction to DRIFT project objectives and WP4 activities;

- Training in literature review methods and relevant software/tools;

Weeks 3–4

- Initial literature search and database development.
- Identification of key sustainability and structural performance criteria;

Weeks 5–6

- Detailed review and categorisation of retrofit materials and techniques;
- Numerical calculations for representative retrofit scenarios;
- Structural volume estimations and retrofit material assessments;

Weeks 7–8

- Synthesis of results and preparation of summary tables and figures;
- Development of recommendations for retrofit material selection and methodologies;
- Preparation of final report and presentation of findings.

Q3 **What techniques/training will the scholarship provide?** (no more than 150 words)

The scholarship will provide the student with training in engineering research methods, sustainable construction assessment, and quantitative analysis techniques relevant to structural retrofitting. The student will gain experience in conducting systematic literature reviews, analysing technical and academic publications, and synthesising engineering evidence into comparative assessment frameworks.

Technical training will include preliminary structural calculations and estimation of structural volumes. The student will also develop skills in data organisation, spreadsheet-based numerical analysis, and technical reporting.

In addition, the internship will provide experience of working within an active EPSRC research environment, including participation in regular supervisory meetings, research discussions, and project planning activities. The project will help develop transferable skills in problem-solving, critical thinking, scientific communication, and independent research.

Q4 **How does this research relate to work being carried out in the supervisor's laboratory?** (no more than 100 words)

This project directly supports ongoing research within the DRIFT project, specifically Work Package 4, which focuses on sustainable retrofitting strategies for existing structures. The student's work will contribute to current activities investigating retrofit material selection and structural assessment methodologies. The proposed literature review and numerical assessments will provide supporting evidence and preliminary analytical outputs that inform wider project objectives related to structural resilience, sustainability, and retrofit optimisation. The internship will therefore contribute directly to the broader research themes in the department, including sustainable infrastructure, structural engineering, and decarbonisation of the built environment.

Q5 **Please provide a short statement outlining the arrangements that will be put in place to supervise the student** (no more than 200 words)

The student will be closely supervised throughout the internship within the DRIFT research team. Regular weekly supervision meetings will be held to review progress, provide technical guidance, and discuss research findings and next steps. Day-to-day support will also be available through informal meetings and communication with the supervisor. The student will be supported in developing research skills on literature review methods, engineering calculations, data analysis and technical writing. Feedback will be provided regularly on draft outputs and presentations.

At the start of the project, the student will receive an induction covering the objectives of the DRIFT project, research methods, relevant software/tools, and expectations for reporting and

Engineering and Physical Sciences Research Council

Brunel University of London

documentation. Clear milestones and deliverables will be established to structure the work programme across the internship period.

Project Supervisor's Signature:	Marianna Ercolino	Date:	29/05/2026