School of Computing, Engineering, and the Built Environment
Edinburgh Napier University

PHD STUDENT PROJECT

Funding and application details

Funding status: Self funded students only

Application instructions:
Detailed instructions are available at https://blogs.napier.ac.uk/scebe-research/available-phd-student-projects/

Prospective candidates are encouraged to contact the Director of Studies (see details below) to discuss the project and their suitability for it.

Project details

Supervisory Team:
- DIRECTOR OF STUDY: Mina Jowkar (Email: M.Jowkar@napier.ac.uk)
- 2ND SUPERVISOR: Suha Jaradat

Subject Group: Built environment

Research Areas: Engineering   AND   Architecture, Building & Planning

Project Title: Application of mobile construction as an innovative strategy for building retrofit alteration and addition across the UK

Project description:
Building sector in the UK contributes to nearly half of the UK energy use and about 30% of the national Greenhouse Gas (GHG) emissions. According to Committee on Climate Change (CCC), to meet the UK zero emission target by 2050, 29 million of existing homes in this country must be made low carbon, and resilient to the future climate change [1]. This highlights the need for a more focused attention to optimise retrofit strategies across the UK. Additionally, given the carbon-intensive process of constructing new buildings [2], retrofit plans can also provide the opportunity for alteration and addition of the existing buildings rather than constructing new buildings.

Nevertheless, reports and statistics show that UK building stock is relatively old, 50% of which accounts for residential buildings built before 1970. Retrofit and alteration of such old properties tends to be challenging in the UK as they indicate early mass urban living in this country and, consequently, have strong cultural and architectural value [3]. Thus, more considerations are required to sustainably renovate and alter the function of these buildings whilst maintaining their aesthetic and cultural value. This requires using technologies and innovative solutions to minimize GHG emissions whilst improve amenities for the buildings' occupants in a cost-efficient way.

This project aims to investigate the application of nearly zero-emission mobile constructions as enablers of building retrofit and alteration across the UK. This project will address various aspects of such mobile constructions including energy consumption, environmental impact, cost-efficiency and occupants' comfort and wellbeing.

This study will be carried out through a combination of building performance monitoring (simulation and actual measurement) and field experiment. After a thorough literature review, this includes 1) data collection on the environmental and energy performance of some (selected) existing buildings; 2) propose and finalize the method of construction of the mobile building; 3) modelling, validation and simulation of the indoor environment and energy performance of the spaces including the mobile construction 4) laboratory examination of the optimum scenarios resulted from simulation; 6) final simulation and laboratory examinations to evaluate the performance of the retrofit strategies using the mobile construction.

References:

Candidate characteristics

Education:
A first-class honours degree, or a distinction at master level, or equivalent achievements in Built Environment, Architectural Engineering, civil engineering or other relevant subjects

Subject knowledge:
The applicant should demonstrate educational background in Built Environment, Architectural Engineering, civil engineering or other relevant subjects

Essential attributes:
- Good fundamental knowledge in Built Environment, Architectural Engineering, building renovation, civil engineering and materials
- The followings skills are also required:
    - Building performance and energy simulation
    - Skill and experience

Desirable attributes:
- Familiarity with Post Occupancy Evaluation (POE) and questionnaire design
- Skill in statistical data analysis