



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: Aikaterini Marinelli (Email: A.Marinelli@napier.ac.uk)
- 2ND SUPERVISOR: Aamir Khokhar

Subject Group: Built environment

Research Areas: Built Environment, Civil Engineering, Structural Engineering, Structural Mechanics

Project Title: Optimizing restoration techniques on historic masonry walls

Project description:

Given the increasing demand for strategies aiming at the protection of the structural cultural heritage, developing sustainable methodologies for the use of a variety of civil engineering materials and systems is fundamental for optimizing their global behavior and standardizing intervention techniques that both meet the most up-to-date codification issues at European level and comply with the philosophy and principles of the International Charter for the conservation and restoration of monuments and sites. Engineering problems related to conservation and restoration of Cultural Heritage are attracting attention by engineers and

researchers, offering many opportunities for novel research and industry collaborations.

For the case of the non-extensively studied structural typology of multi-leaf stone masonry walls, the connection between distinct structural wall parts together with the quality and characteristics of all masonry materials involved, are crucial elements of the actual structural response and strongly influence the extent and specific requirements for retrofitting interventions.

The aim of the proposed PhD research is to study, both experimentally and numerically, a variety of strengthening techniques for multi-leaf stone masonry walls appropriate for historic monuments, some of which are already used empirically. The parametric investigation of factors affecting the efficiency of such interventions is needed for their optimization, in terms of both cost and structural performance, and it will contribute to forming design guidelines with applications on historic masonry structures.

References:

- [1] Theodossopoulos, D. (2012) Structural design in building conservation, Routledge.
- [2] Hyslop, E., McMillan, A., Maxwell, I. (2006) Stone in Scotland, UNESCO Publishing.
- [3] Corradi, M., Borri, A., Poverello, E., Castori, G. (2017) The use of transverse anchors as reinforcement of multi-leaf walls. *Materials and Structures*, 50: 114.
- [4] D'Ayala, DF., Paganoni, S. (2011) Assessment and analysis of damage in L'Aquila historic city centre after 6th April 2009. *Bull Earth Eng* 9 (1): 81

Candidate characteristics

Education:

A first-class honours degree, or a distinction at master level, or equivalent achievements in Civil Engineering, with emphasis on Structures and Structural Mechanics

Subject knowledge:

- Structural Analysis,
- Mechanics of Materials
- Computational Mechanics
- Structural Laboratory academic work experience

Essential attributes:

- Knowledge of Structural engineering with applications on Masonry structures,
- Experience of fundamental laboratory skills,
- Competency in computational mechanics,
- Good written and oral communication skills,
- Strong motivation, with evidence of independent research skills relevant to the project,
- Good time management