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

PHD STUDENT PROJECT

Application instructions:
Detailed instructions are available at :
https://www.napier.ac.uk/research-and-innovation/doctoral-college/how-to-apply

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: Prof. Robert Hairstans (Email: r.hairstans@napier.ac.uk)
- 2ND SUPERVISOR: Dr Andrew Livingstone

Subject Group: Built Environment

Research Areas: Architecture, Built Environment

Project Title: Engineered Timber Solutions for Circularity

Project description:

There is a global market shift towards sustainable construction methods and correspondingly increased demand for mass timber products and systems with an emphasis on cross-laminated and glue-laminated timber forms. Edinburgh Napier University has undertaken substantial work to demonstrate the technical and commercial viability of mass timber from UK source timber from a mechanical, engineering, productivity, and cost perspective working with an extensive array of industry partners. These products are now being successfully commercialised with further information available via the Transforming Timber platform.

A key attribute to the sustainability credentials of mass timber construction is its ability to sequestrate carbon. In-line with the principles of circularity the value return from the resource requires to be maximised beyond its initial utilisation by embracing the concepts of Design for Manufacture and Assembly and Disassembly (DfMA+D) and Reassembly (DfMA+D and R). Designing for circularity in this manner ensures that carbon remains locked into the fabric of the built environment for longer than the original 60-year design-life of buildings.

However, current design and construction practices don't necessarily take this into account.

The purpose of this PhD project is to review the latest in thinking in terms of designing for circularity and also to take into account the historical context for such approaches i.e. traditional methods of detailing and connecting utilising carpentry approaches. This information will be brought together and reviewed in combination with the latest in computer aided design / computer aided manufacture (CAD/CAM) and computer numerical control (CNC) methods of detailing and manufacturing precision engineered sub-assemblies and timber engineered systems. The objective will be to derive new and novel approaches for connecting structural timber systems in-line with the principles of circularity.

The extensive timber technology manufacturing and test facilities of Edinburgh Napier University and its partner network will provide scope to manufacture and test the derived solutions. Further, via the industry network there will be opportunities to validate solutions with respect to real life applications and to stress test viability and scalability.

References:

[1] Climate Change Committee
[2] Environmental Audit Committee
[3] Transforming Timber
[4] Transforming Timber (napier.ac.uk)

Candidate characteristics

Education:

A second class honour degree or equivalent qualification in Built Environment subject i.e. Civil / Structural Engineering; Architecture / Architectural Technology;

Subject knowledge:

The candidate should have fundamental knowledge of sustainability, timber in construction and the built environment.

Essential attributes:

- Knowledge of timber as a material
- Structural engineering and analysis
- Competent communicator capable of engaging with industry and external stakeholders
- Good written and oral communication skills
- Strong motivation, with evidence of independent research skills relevant to the project
- Good time management

Desirable attributes:

- Architectural detailing
- CAD / CAM