NTU DOCTORAL SCHOOL

NOTTINGHAM TRENT UNIVERSITY

"Creating future innovators and impact for education, industry, the professions and society"

Nottingham Trent University

Doctoral School

School of Architecture, Design and the Built Environment

PhD Projects - 2016

Welcome to the Nottingham Trent University Doctoral School

The Doctoral School provides a supportive environment and a thriving research culture that encourages you to reach your full potential as a research degree student.

Valuing ideas, enriching society

We encourage new ideas and new ways of thinking across the whole University through a culture of discovery and innovation. We believe our research has the potential to impact the world we live in and change lives.

Research excellence

Our research is recognised across the world. In the most recent Research Excellence Framework (Ref 2014) most of our research was considered internationally-excellent or world-leading.

The University is committed to developing and expanding its activity to increase the scope, quality and impact of our research.

Be part of our research

With MPhil, PhD and Professional Doctorate research degree opportunities across each of our academic schools, we support students conducting research in a diverse range of areas. Our research students form an important part of our research community and make a significant contribution to our activity.

We offer full-time, part-time and distance learning research degree opportunities.

Our Professional Doctorates offer you the opportunity to contribute to research in your profession while attaining a research qualification.

A supportive community

We are committed to supporting and developing our research students.

You will have academic, administrative and personal support throughout your studies and access to dedicated workspace and exceptional facilities.

Excellent support throughout your studies

The Doctoral School aims to provide excellent personal and practical assistance for our research students creating a supportive and pro-active environment.

Support and guidance

Your main source of advice and support will be your own doctoral supervisory team, which will include a director of studies and at least one other supervisor. This team will be selected based on their experience in your chosen area of study or their background in relevant practice.

The Doctoral School Team will be available throughout your studies. Our dedicated team will offer advice and guidance for your initial enquiry and application and introduce you to the University and to your supervisory team.

Outstanding facilities

As a research student at NTU you will have access to a wealth of facilities and resources to aid and enhance your studies. The University is committed to providing the best possible facilities for all its students and we are constantly investing in new facilities and learning environments.

Dedicated study areas

All our research students are able to use study and writing areas giving you access to desks, laboratories and IT facilities when you need it.

Learning resources

Students at Nottingham Trent University have access to a wealth of library materials including over 480,000 books and 1,300 printed journals, as well as an extensive audio-visual collection of DVDs, videos and slides.

Electronic library resources are an increasingly important part of the support offered to research students, and more than 290 databases and 17,000 eJournals are accessible from any networked PC within NTU, or from your home or off-campus PC.

Our experienced and knowledgeable library staff will help guide you to the most useful sources of information.

Developing the next generation of researchers

We aim to nurture research talent and help our students thrive through their research degrees and into their future careers.

Researcher Development Programme

All research students are expected to participate in a rolling programme of professional development. You will have the opportunity to attend a range of workshops and developmental activities mapped to the Vitae Researcher Development Framework (RDF).

Our Research Development Programme empowers you – in discussion with your supervisory team – to create an individualized package of activities to support your career development as a researcher.

A range of core activities will support your journey from enrolment at NTU as a research student, through to final submission of your thesis. These activities will be complemented by a series of electives that you will choose to pursue, depending upon your developmental needs as you progress in your research work.

Developing your career

We pride ourselves on equipping our students with knowledge and skills and encouraging initiative, innovation and excellence.

Our research students are encouraged to take part in conferences, seminars and external networks. These are an excellent opportunity for you to share your work, meet other researchers and build a network of contacts.

Our own research conferences and seminars offer you the opportunity to present and discuss your work among the NTU research community.

You may also have the opportunity to teach undergraduate students or supervise laboratory work.

School of Architecture, Design and the Built Environment

We have an active and outward looking research culture, with a strong focus on impact and external engagement.

The School has over 30 research active staff, around 60 PhD students and five Professional Doctorate students.

In REF 2014 86% of our research was judged to be world leading, internationally excellent or internationally recognised.

Research themes and areas

Our research is divided into two areas:

Architecture and Built Environment research

- Architectural Heritage and Identity
- Real Estate
- Sustainable Technologies
- Lean Project Management
- Smart Heat Network

Project Design research

- Sustainable Consumption
- Design for Health and Wellbeing
- Advanced Design and Manufacturing Engineering

Professional Doctorates

- Doctor of Architecture (DArch)
- Doctor of Engineering (EngD)
- Doctor of Engineering in Civil Engineering (EngD)
- Doctor of Engineering in Construction Management (EngD)
- Doctor of Design (DDes)
- Doctor of Real Estate (DRealEst)

Project Titles (descriptions below)

1. Dr Hynda Aoun Klalib – Flexural behaviour of reinforced concrete beams with recycled aggregate

2. Dr Sarah Kettley – Augmenting human identity; experiences with expressive prosthetics

3. Professor Marjan Sarshar – Scaling up community energy

4. Ahmed Mohamed – Investigation into the feasibility of the utilisation of renewable energy resources in Libya

5. Dr Rolands Kromanis – Vision-based structural health monitoring of bridges

1.
Flexural behaviour of reinforced concrete beams with recycled aggregate

Today we are confronted with a significant consumption and a growing need for aggregates because of growth in industrial production. This situation has led to a substantial decrease in available resources. On the other hand, a high volume of demolition waste has generated a considerable amount of recycled aggregates that should be used in concrete production for construction purposes. The aim of this research is to demonstrate the prospect of using recycled aggregate as a substitute for natural aggregate in structural concrete. The research focuses on various practical formulations of concrete used to fabricate beams that will be tested to investigate their flexural failure. The emphasis analysis is on mechanical properties of the concrete and the beams' behaviour (flexural and shear resistance, deflection, cracking, stresses and strains).

Publications

Directly associated to the research project:

- **2011** HEBHOUB H, **AOUN H**, BELACHIA M, HOUARI H, GHORBEL E, Use of waste marble aggregates in concrete**. Constructions and Building Materials, Elsevier**, **ISSN: 0950-0618**, vol.25/3, pages1167-1171.
- **2006** BELACHIA M, **AOUN H**, HEBHOUB H, Marble wastes as a substitute in hydraulic concrete. **The Journal of Solid Waste Technology and Management** (USA), **ISSN: 1091-8043**, pages 456-463.

Indirectly associated to the research project (Sustainable Construction):

- **2017** ROBINSON J, **AOUN KLALIB H**, DAVISON M, Determining Moisture Levels in Straw Bale Construction. **Procedia Engineering, Elsevier, ISSN: 1877-7058. (Accepted)**

Supervisors: Dr Hynda Aoun Klalib and Dr Adam O'Rouke

Supervisor biogs

Dr Hynda Aoun Klalib and *Dr Adam O'Rouke's* main research interests are:

- Recycled aggregate for construction and building materials
- New structural, construction and sustainable materials (Rheology and Practices)
- Durability and Structural response of reinforced concrete structures

Entry Requirements

You will need:

- a minimum of a first or second-class degree or a Master's degree in a relevant discipline
- a period of pre-PhD study is required for some subjects before entry to a PhD
- and / or evidence of motivation and ability to conduct research at higher degree level.

International students will also need to meet the English language requirements - IELTS 6.5 (with minimum sub-scores of 6.0).

Applicants who have taken a higher degree at a UK university are normally exempt from the English language requirements. Applicants who do not meet the English language proficiency requirement will normally be asked to complete an English Language course.

Contact: Hynda.klalib@ntu.ac.uk or adam.orourke@ntu.ac.uk for informal discussions.

Applications should be made to the **Doctoral School** – www.ntu.ac.uk/doctoralschool

2.
Augmenting human identity; experiences with expressive prosthetics

The experience of amputees with prosthetics has an impact on not only physical capability but also mental health and wellbeing. Identity is created by individuals in relation with and through their body and its technological augmentation in social contexts.

New approaches to design involving end-users emphasise the importance of subjective experience, and understandings of the body in light of critical theory. At the same time, smart materials and manufacturing processes offer opportunities for innovative solutions to technical issues, and the development of new expressive opportunities for prosthetics development.

Previous work has shown that textiles may be engineered for structural strength and flexibility, the ways in which gaming can become a part of rehabilitation or training, and how identity is informed by, and impacts on, group membership. New approaches to participatory design are being explored, which open up methods for personalisation in products for health and wellbeing.

The project will involve a participatory approach to development of theory and design practice. The candidate will identify new research questions within a popular field, informed by the social sciences and psychology, and will be supported to develop novel material approaches to manufacture.

Publications

- Breedon P, (Ed), 2012. Smart Design: First International Conference, Springer.
- Breedon P, Byrom, B., Siena F and Muehlhausen W, (IN PRESS), Enhancing the measurement of clinical outcomes using Microsoft Kinect, Journal of Assistive Technologies/IEEE Explore.
- Breedon P & Pacey -Lowrie J, Life-like prosthetic eyes: the call for smart materials, 2014, Expert Review of Ophthalmology.
- Glazzard M & Breedon P, 2014, Weft-knitted auxetic textile design, Phys. Status Solidi B 251, No. 2, pp. 267–272, (DOI 10.1002/pssb.201384240).
- Kettley, S., Kettley, R. and Lucas, R. (IN PRESS). Towards a Person Centred Approach to Design for Personalisation. In I. Kuksa and T. Fisher (Eds.). Design for Personalisation. Routledge.
- Kettley, R., Lucas, R., Jones, I. & Kettley, S. (IN REVIEW). Practice-led Critical Reflection on the Ethics of 'An Internet of Soft Things'. Special Issue of the Journal of Assistive Technology (JAT), Vol 10 Issue 3, September 2016.
- Kettley, S, Kettley, R. & Bates, M. (2015). Participatory Design and the Humanist Landscape (workshop). The 2015 ACM International Joint Conference on Pervasive and Ubiquitous Computing (UbiComp 2015), Sep. 7-11, Osaka, Japan.
- Wakefield, J.R.H, Hopkins, N., & Greenwood, R.M. 2014. Help-seeking helps: Help-seeking and group image. Small Group Research, 45, 89-113.
- Wakefield, J.R.H., Bickley, S., & Sani, F. 2013. The effects of identification with a support group on the mental health of people with multiple sclerosis. Journal of Psychosomatic Research, 74, 420-426.
- Wakefield, J.R.H., Hopkins, N., & Greenwood, R.M. 2012. Meta-stereotypes, social image and help seeking: dependency-related meta-stereotypes reduce help-seeking behaviour. Journal of Community & Applied Social Psychology, 23, 363-372.

Supervisors: Dr Sarah Kettley, Professor Philip Breedon and Dr Juliet Wakefield

Supervisor biogs

Dr Sarah Kettley is Reader in Relational Design within the Product Design subject area. She has worked with user experience and meaning making in the fields of wearable computing and e-textiles since 2002, with an increasing focus on wellbeing and mental health. She can support candidates in the application of craft and fashion theory to wearables and prosthetic development. Sarah has acted as PI on a number of related UKRC and internally funded projects.

Professor Philip Breedon is a Professor in Smart Technologies. His research interests focus on the utilisation of new and emerging materials and technologies, and includes biomimetics, biomaterials, biorobotics, wearable technologies, intelligent environments and investigative research related to the utilisation of 'smart materials' for clinical and medical applications related to in vivo devices. He works with a multidisciplinary group of clinicians, therapists, surgeons and patients to undertake patient-centred research.

Dr Juliet Wakefield completed her PhD in Social Psychology in 2011. Her PhD research concerned the act of help-seeking, and investigated whether group members may use help-seeking as a tool to manage and enhance their group's image in the eyes of others. Juliet then worked on the ESRC-funded Health In Groups project. This project investigated the relationships between membership of social groups (such as family, community, sports groups) and health. In general, Juliet's research concerns the implications of group membership for people's everyday lives.

Entry Requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or equivalent according to NARIC) with a minimum of a merit, and/or a UK 1stClass/2.1 Bachelor's degree (or equivalent according to NARIC) in design, the social sciences, psychology or a related subject. The minimum English language proficiency requirement for candidates who have not undertaken a higher degree at a UK HE institution is IELTS 6.5 or TOEFL 560/iBT 94-95

Contact: sarah.kettley@ntu.ac.uk for informal discussions.

Applications should be made to the **Doctoral School** – www.ntu.ac.uk/doctoralschool

3.
Scaling up community energy

Community energy is a growing rapidly – from retrofitting homes, reducing bills through local authority owned energy companies and collective switching schemes, to generating sustainable electricity and heat through community co-operatives and social enterprises. Local authorities (LAs) have a huge stake in its continued success: it can help deliver local economic regeneration, a stronger sense of community, and other policy priorities such as improving public health and the energy efficiency of housing .

Local government is uniquely placed to support, partner and invest, and to provide a positive planning and policy environment to help drive a community energy revolution. Though some LAs have started to embark on innovative action to scale up CE, in most cases CE is not yet a holistic and mainstream activity in cities' regeneration and sustainable energy endeavours. Most CE projects remain ad-hoc and are reliant on the heroic efforts of climate change vanguards. The aim is to scale up CE and community engagement, so that they becomes a core part of cities' sustainable regeneration futures.

This project will draw on organisational change management literature, capability maturity models, community energy and community engagement. Much of the research will be qualitative in nature.

Supervisor: Professor Marjan Sarshar and Bahareh Kaveh

Supervisor biogs

Prof Marjan Sarshar is a Professor in Sustainable Built Environment. She is currently working on the H2020 funded Remourban project (www.Remourban.eu) in the areas of: (i) community energy and engagement in energy and (ii) city replication models.

Babareh Marjan was the Associate Dean for Research in College of Arts Design and the Built Environment at NTU (2011-2014), and Director of Institute of Energy and Sustainable Development (IESD) at DMU (2009-2011). She has led over £6.5 m of personal research projects in the areas of: (i) organisational capability (ii) low carbon built environment; and (iii) ICT integration.

Entry requirements
1st class degree in business or other related subjects

The following two are optional:

- Experience (research or industrial) in community energy and community engagement
- Experience in qualitative data collection and analysis, in particular using NVivo

Contact: marjan.sarshar@ntu.ac.uk for informal discussions.

Applications should be made to the **Doctoral School** – www.ntu.ac.uk/doctoralschool

4.
Investigation into the feasibility of the utilisation of renewable energy resources in Libya

Renewable energy in Libya, in particular solar and wind energy, can partly cover current local energy demands. It can also, through connections to the Middle East, Africa and Europe, provide neighbouring countries with electricity. Additionally, with the increase in energy demand around the world, and the international effort to reduce carbon emissions from fossil fuels, there has been a drive in many oil-rich countries to diversify their energy portfolios and resources. Libya is currently interested in utilising its renewable energy resources in order to reduce the financial and energy dependency on oil reserves.

This research investigates the current utilisation and the future of renewable energy in Libya, and the challenges and opportunities for investment in renewable energy in Libya. This study has explored the possibility of utilising the available renewable energy resources in Libya to offer the Libyan government a strategy for providing sustainable energy resources. This is expected to reduce carbon emissions, and help achieve an economically, socially and environmentally sustainable energy future. Interviews have been conducted with managers, consultants and decision makers from different government organisations, and have included energy policy makers, energy generation companies and major energy consumers.

A comprehensive survey has been conducted to evaluate several characteristics of domestic energy demand and energy consumption in Libya. The results show that Libya could generate more energy from the sun than Oil and Libyans could save a power station-worth of energy by introducing basic and simple eco measures.

Publications

- Ahmed M. A. Mohamed, Amin Al-Habaibeh, Hafez Abdo and Sherifa Elabar, (2015) “Towards exporting renewable energy from MENA region to Europe: An investigation into domestic energy use and householders’ energy behaviour in Libya”, Applied Energy Journal, vol. 146, p 247–262.
- Ahmed M. A. Mohamed, Amin Al-Habaibeh and Hafez Abdo, (2013) “An Investigation into the Current Utilisation and Prospective of Renewable Energy Resources and Technologies in Libya”, Renewable Energy an international journal, vol. 50 , p732-740.
- Ahmed M. A. Mohamed, Amin Al-Habaibeh, Hafez Abdo and Juma R. Abdunnabi, (2013),“The significance of utilising Renewable energy options into the Libyan an energy mix,” Energy Research Journal, vol. 4, (1): p 15-23.
- Ahmed M. A. Mohamed, Amin Al-Habaibeh and Hafez Abdo, (2012), “The importance of renewable energy in Libya: historical overview”, third Annual ADBE Research Conference and Festival in the NTU, 28 June 2012.
- Ahmed M. A. Mohamed, Amin Al-Habaibeh, Hafez Abdo and Abdelsalam Elhaffar, (2013), “An Investigation into the Importance of Developing the Renewable Energy Sector in Libya,” vol. 113, International conference on Electrical and Computer Engineering (ICECE). 26-28 March 2013, Benghazi- Libya.
- Ahmed M. A. Mohamed, Amin Al-Habaibeh and Hafez Abdo, (2015), “Future prospects of the Renewable Energy Sector in Libya,” vol. 132 SBE16 Dubai International Conference, January 17-19, 2016.

Supervisors: Professor Amin Al-Habaibeh and Dr Hafez Abdo

Supervisor biogs

Amin Al-Habaibeh is Professor of Intelligent Engineering Systems within the Product Design team at Nottingham Trent University. His research and teaching activities focus

on several multi-disciplinary topics in the broad area of product design and energy. Amin is currently leading the Innovative and Sustainable Built Environment Technologies research group (iSBET) and co-founder of the Advance Design and Manufacturing Engineering Centre (ADMEC). Amin is a Chartered Engineer and member of the Institution of Engineering and Technologies (The IET).

Dr. Hafez Abdo is a senior lecturer in accounting at the Nottingham Business School. His research focuses on Energy Policy mechanisms and tools, with focus on renewable energy options, energy security and energy strategies. He also has an interest in Oil and Gas Accounting and Petroleum Fiscal regimes.

Entry requirements
You will need:

- a minimum of a first or second-class degree or a Master's degree in a relevant discipline
- a period of pre-PhD study is required for some subjects before entry to a PhD
- and / or evidence of motivation and ability to conduct research at higher degree level.

International students will also need to meet the English language requirements - IELTS 6.5 (with minimum sub-scores of 6.0).

Applicants who have taken a higher degree at a UK university are normally exempt from the English language requirements. Applicants who do not meet the English language proficiency requirement will normally be asked to complete an English Language course.

Contact: amin.al-habaibeh@ntu.ac.uk for informal discussions.

Applications should be made to the **Doctoral School** – www.ntu.ac.uk/doctoralschool

5.
Vision-based structural health monitoring of bridges

Many bridges which compose an integral part of the transportation infrastructure have reached the end of their design life. Their maintenance costs are raising and soundness is frequently questioned. For example, (i) the collapse of the I35W Bridge (Minneapolis, USA) in 2007 took lives of 13 people and injured 145; a daily economic loss was estimated to raise up to $220,000; (ii) the closure of the Forth Road Bridge (Edinburgh, UK) in late 2015, left a significant impact on economy in Scotland considering that a closure of a carriageway for one day can cost up to £650,000. Bridge collapses and closures can be prevented when detecting damages early. This can be achieved with the aid of bridge health monitoring systems.

A successful PhD student will work on a development of a smart monitoring system which is composed of high resolution and thermal imaging cameras. In comparison to conventionals monitoring systems, which encompass data acquisition devices and sensors which have to be installed on a bridge, smart monitoring systems consist of non- contact devices, hence requiring no access to the bridge. The aim of such systems is to watch over a bridge (i) capturing traffic, deformations and bridge temperature and (ii) analysing this information in real-time to identify early signs of damage.

Publications

- Kromanis, R. and Kripakaran, P. 2016. SHM of Bridges: Characterising Thermal Response and Detecting Anomaly Events Using a Temperature-Based Measurement Interpretation Approach. Journal of Civil Structural Health Monitoring 6(2), pp. 237–254.
- Lee, J.J. and Shinozuka, M. 2006. A vision-based system for remote sensing of bridge displacement. NDT & E International 39(5), pp. 425–431. Available at: http://linkinghub.elsevier.com/retrieve/pii/S0963869505001829 [Accessed: 10 July 2013].
- Zaurin, R. and Necati Catbas, F. 2010. Structural health monitoring using video stream, influence lines, and statistical analysis. Structural Health Monitoring 10(3), pp. 309–332. Available at: http://shm.sagepub.com/cgi/doi/10.1177/1475921710373290 [Accessed: 14 April 2014].

Supervisors: Dr Rolands Kromanis and Professor Haida Liang

Supervisor biogs

Dr Kromanis' research is focused on the structural performance evaluation of bridges using measurements from continuous monitoring, specifically using non-contact sensing technologies such as cameras or lasers. Dr Kromanis' research investigates data-driven strategies for characterizing and predicting thermal response that exploits the relationships between temperature distributions across a bridge and measured bridge response. He was also a practising structural engineer involved in engineering consultancy and energy-efficient housing projects in Europe.

Prof Liang was the principal investigator of a EPSRC funded project on the development of a portable 3D spectral imaging system for imaging from stand-off distances applied to ancient wall paintings. Prof Liang has expertise in remote sensing, instrumentation and image processing both in the context of astronomy (the ultimate remote sensing application) and terrestrial applications in historical wall paintings and buildings. Prof

Liang teaches hyperspectral imaging in the MSc module on materials and security imaging.

Entry Requirements
In order to be eligible to apply, you must hold, or expect to obtain, a UK Master's degree (or equivalent according to NARIC) with a minimum of a merit, and/or a UK 1stClass/2.1 Bachelor's degree (or equivalent according to NARIC) in engineering, or related subject. The minimum English language proficiency requirement for candidates who have not undertaken a higher degree at a UK HE institution is IELTS 6.5 or TOEFL 560/iBT 94-95.

Contact: rolands.kromanis@ntu.ac.uk for informal discussions.

Applications should be made to the **Doctoral School** – www.ntu.ac.uk/doctoralschool