Project Reference: CTE_EMERC_Steve_Dunn_002_25_26

About the Project

This is an exciting PhD opportunity within the College of Technology and Environment (CTE) at London South Bank University (LSBU). The successful candidate will receive a tuition fee waiver beginning in September 2025 for 4 years, including the write-up year. All other costs are to be borne by the successful applicant.

Project Title

Using piezoelectric sensors with machine learning for structural health monitoring of a railway network

Project Overview

Producing low cost and reliable sensors for structural health monitoring remains a significant challenge for the railway network. An exciting and new approach used the inherent vibration from the rail network to act as the input signal in a structural health monitoring system. By applying a learning algorithm to the input signal, the 'safe' steady state of the environment can be determined. This then means that any changes can be monitored and reported enabling early detection of changes and preventing further damages.

In this project you will produce a new range of ZnO based sensors that have a response tailored to the vibration in a railway track. You will then develop a range of algorithms that enable details of any changes to the railway track to be measured and monitored. By engineering these systems, your PhD project will help to provide solutions to increase the safety of a rail network and develop the next generation of low-cost rail sensors.

Specific areas of interest for this project are to develop complete structural health sensors and new algorithms that are using the piezoelectric effect to measure and monitor vibration in the rail. This will involve making the piezoelectric diodes and developing the required mathematic analysis tools.

You will be working in the laboratory developing and producing a range of materials combinations. This is a 'hands on' project for someone who enjoys making and testing materials, as well as someone with an interest in AI and future mathematical approaches to understanding structural health. The project benefits from extensive investment in research towards sustainable technology at LSBU and you will have access to a wide range of tools required to complete your PhD these include solar simulators, PCE, UV vis, IR, GC MS, GC, SEM, XRD, AFM, raman, a range of furnaces and materials processing/chemistry laboratories, and access to high performance computing facilities.

The supervision team consists of: Prof Dunn (dunns4@lsbu.ac.uk) has supervised over 30 PhD students with an international reputation for high quality research in the area of functional material catalysis, and Dr Cadenas an acknowledged expert in machine learning and AI.

Who Are We Looking For?

- Open to any UK or international candidates. Starting in September 2025.
- The candidate must meet the minimum entry requirements for our PhD programme by clicking the 'Apply' link.
- A keen interest in laboratory-based synthesis and manufacturing is vital.
- The ability to work in a team while developing a creative and novel solution to problems will be important.
- An ability to develop an understanding of machine learning and AI will be beneficial.

Selection Criteria:

- Academic Qualifications - You should normally have at least a 2.1 honours degree from a UK University or an equivalent qualification in engineering, computer science, etc.
- Research and Analytical Skills – Ability to research subjects using libraries, the internet, and other information resources, ability to conduct comprehensive literature reviews, experience in qualitative and quantitative data collection and analysis, strong research design and methodology skills, ability to independently collaborate with stakeholders, and excellent academic writing and communication skills.
- **Professional Skills -** Project management and organisational skills, ability to work independently and as part of a team, problem-solving and critical thinking skills, and adaptability and willingness to learn new skills.
- Software and Modelling Experience - Experience developing and utilising spreadsheet-based models (e.g., Microsoft Excel) to an advanced level. Experience with other software packages relevant to the discipline would be an advantage.
- Communication Skills—The candidate should be highly motivated, able to collaborate, have good visual, oral, and written communication skills, and communicate the work's outcomes to commercial, industrial, and scientific audiences.
- Teamwork and Collaboration - Ability to work with industrial and academic supervisors.
- Language Proficiency - Overseas applicants must have a minimum English language IELTS score of 6.5, with at least 5.5 in any of the components.
- Understanding of Equality and Diversity - Able to demonstrate an understanding of equality and diversity and their practical applications.
- Visa and Legal Requirements - Non-EU/EEA nationals may need to apply to the Foreign and Commonwealth Office (FCO) for clearance from the Academic Technology Approval Scheme (ATAS).

Training & Development Opportunities

Doctoral students at London South Bank University (LSBU), through the London Doctoral College (LDC), benefit from a rich and structured training environment designed to support academic excellence and professional development. All PhD candidates are offered a comprehensive programme of workshops and seminars covering essential research skills, including research design, data analysis, academic writing, ethics, and project management. These sessions aim to support students through every stage of their doctoral journey—from literature review and methodology to thesis completion and viva preparation. Postgraduate researchers can access advanced, discipline-specific training aligned with their research focus. LSBU's doctoral training environment is designed to build deep expertise in a chosen research area and the broader skills necessary for successful careers in research, industry, and beyond.

About the College

The College of Technology and Environment (CTE) at London South Bank University (LSBU) is a newly formed academic college, launched in January following the university's recent reorganisation. Led by Executive Dean Professor Chris Harty, CTE brings together four schools: Architecture & Planning, Construction, Property & Surveying, Engineering & Design, and Computer Science & Digital Technologies. The college fosters a collaborative and interdisciplinary environment, addressing the complex challenges of the built and digital environments. CTE strongly emphasises research, with doctoral students playing a key role in shaping and contributing to the college's research agenda. CTE prepares students to become future leaders through innovation, industry partnerships, and a commitment to sustainability. With a focus on real-world impact and academic excellence, the college is set to drive forward LSBU's vision of delivering applied knowledge that transforms lives and communities locally and globally. The university has five centres, and any academic staff and students in the college can join. These research centres are described below.

About the Bioscience and Bioengineering (BB) Research Centre

The Bioscience and Bioengineering Research Centre advances understanding of health and disease through biological research and innovative technologies. Our interdisciplinary team focuses on improving diagnostics, treatments, and patient management across healthcare settings. Areas of expertise include cancer biology, bioinformatics, pharmacokinetics/pharmacodynamics, microwave and ultrasound sensing, and image analysis. We also explore human biomechanics and the mechanical properties of muscle and tendon in both healthy and diseased states. By integrating science and engineering, we strive to translate cutting-edge research into real-world healthcare improvements that benefit patients and practitioners alike.

About the Building Future Communities (BFC) Research Centre

The Building Future Communities Research Centre supports inclusive, participatory research on real-world transformation and social justice. We work collaboratively with diverse stakeholders—charities, community groups, local authorities, and more—to co-create research with impact. Using an intersectional approach, our work spans funded research, enterprise, consultancy, and researcher development. BFC is a creative and unifying umbrella for projects prioritising community voice and engagement. Our goal is to drive positive change through research that reflects and responds to the needs and experiences of communities, with a clear commitment to inclusion, equity, and collaborative practice.

About the Digital x Data (DD) Research Centre

Digital x Data Research Centre is a university-wide interdisciplinary research centre exploring the impact and potential of digitalisation and datafication. We focus on cutting-edge AI and data science developments, addressing opportunities and challenges through a responsible, explainable, and sustainable lens. Rooted in LSBU's commitment to social justice, our research fosters equity by integrating science, technology, the arts, and the humanities. We drive innovation through applied research and strong partnerships with industry, academia, and the public sector and ensure that our work delivers real-world, transformative outcomes. Our approach is collaborative and future-facing, aiming to inform policy, practice, and public understanding.

About the Energy, Materials and Environment (EME) Research Centre

The Energy, Materials and Environment Research Centre leads interdisciplinary research on sustainable energy systems and material innovation. We address climate change by developing whole energy systems, spanning generation, storage, distribution, and consumption. Our research draws from materials engineering, policy, and societal impact to understand and influence the complex relationships between energy, economy, and society. With expertise in multiscale systems and cross-sector collaboration, we aim to shape policy and technology that supports the transition to a low-carbon future. Our work informs sustainable development strategies that balance environmental, economic, and social needs across local and global contexts.

About the Health and Wellbeing (HW) Research Centre

The Health and Wellbeing Research Centre promotes understanding how to protect and enhance health and wellbeing across all life stages. We focus on underserved populations and the services and professionals supporting them. Our research, grounded in social justice and inclusion, aims to reduce inequalities and improve outcomes through knowledge mobilisation and real-world application. Collaborating with academics across disciplines and health and social care partners, we explore lived experiences, service delivery, and workforce development. Our work informs policies and practices that support more effective, inclusive, and responsive health and social care systems.
For Enquiry

Contact Person

Before applying, please contact Professor Steve Dunn (dunns4@lsbu.ac.uk) for an informal conversation about the project and suitability.

In your email, include:

- Details of your current/expected academic results.
- A summary of any relevant experience.
- A brief paragraph about your motivation for pursuing this PhD project.

Fee Waiver

The fee waiver is available for 4 years (48 months), including the writing-up year, examination period, and submission of the corrected thesis.

How to apply

Applications should be submitted via the programme page using the links below:

https://www.lsbu.ac.uk/study/course-finder/chemical-process-and-energy-engineering-phd

You should upload the problem statement, qualifications, CV, and other relevant documentation to the application portal. Remember to state the correct reference number and the appropriate supervisor.