

### PhD studentship (Full-time)

Institution	Xi'an Jiaotong-Liverpool University, China
School	Department of Civil Engineering, Design School
Supervisors	Principal supervisor: Dr Engui Liu (XJTLU) Co-supervisor: Dr Weijian Han (JITRI) Co-supervisor: Dr Shiyao Huang (JITRI) Co-supervisor: Dr Hyung-Joon Seo (UoL)
Application Deadline	Open until the position is filled
Funding Availability	Funded PhD project
Project Title	Integrated computational materials engineering methodology development for customization of bone cement
Contact	Please email <a href="mailto:engui.liu@xjtlu.edu.cn">engui.liu@xjtlu.edu.cn</a> and <a href="mailto:huangsy@jitri-amrd.com">huangsy@jitri-amrd.com</a> with a subject line of the PhD project title

#### **Requirements:**

The candidate should have a first-class or upper second class honors degree or a master's degree (or equivalent qualification) in mechanics, materials, or relative fields; be familiar with CAE and CAD software (e.g., ABAQUS); has user-defined subroutine development experience (e.g., UMAT, VUMAT) and data analysis experience, and preferably has the microstructural characterization skills on materials.

Evidence of good spoken and written English is essential. The candidate should have an IELTS score of 6.5 or above, if the first language is not English. This position is open to all qualified candidates irrespective of nationality.

#### **Degree:**

The student will be awarded a PhD degree from the University of Liverpool (UK) upon successful completion of the program.

#### **Funding:**

This PhD project is a collaborative research project between XJTLU (<http://www.xjtlu.edu.cn>) in Suzhou and JITRI (Jiangsu Industrial Technology Research Institute) Yangtze Delta Region Institute of Advanced Materials in Suzhou.

The student will be registered as an XJLTU PhD student but is expected to carry out the major part of his or her research at the Yangtze Delta Region Institute of Advanced Materials in Suzhou.

The PhD studentship is available for three years subject to satisfactory progress by the student. The award covers tuition fees for three years (currently equivalent to RMB 80,000 per annum). In addition, during the period of undertaking main research at institute in Suzhou, the PhD candidate will be provided with monthly living allowance at a standard 5000 RMB by Yangtze Delta Region Institute of Advanced Materials.

### **Project Description:**

Bone cement is a crucial material for the artificial vertebral body in treating osteoporosis. There is a definite need to design mechanical properties of bone cement according to the unique features of each osteoporotic vertebral. This project aims to develop an integrated computational materials engineering methodology for bone cement customization. To achieve this goal, experiments will be conducted to reveal the relationship between bone cement compositions, microstructure, and mechanical properties. A representative volume element (RVE) model will be developed, and finite element simulation will be carried out to predict the properties of bone cement with different compositions. On the other hand, a multiscale model will be developed to predict vertebral properties. Then it will be integrated into an optimization framework to guide composition design according to the features of each osteoporotic vertebral.

The ultimate objective of this project is to develop an integrated computational materials engineering methodology for bone cement customization and provide guidance to design the compositions and mechanical properties of bone cement according to the unique features of each osteoporotic vertebral. The study procedure is intended to be the following to achieve this grand goal:

- Measure the mechanical properties of each constituent element. Build up a model to predict vertebral properties according to features of each osteoporotic vertebral. Establish a database for bone cement.
- Build up a multiscale computational model to guide composition design according to features of each osteoporotic vertebral. Establish the relationship between bone cement compositions and mechanical properties.
- Optimize the design of bone cement compositions according to specific mechanical properties requirements of bone cement.

For more information about doctoral scholarship and PhD programme at Xi'an Jiaotong-Liverpool University (XJTLU): Please visit

<http://www.xjtlu.edu.cn/en/study-with-us/admissions/entry-requirements>

<http://www.xjtlu.edu.cn/en/admissions/phd/feesscholarships.html>

### **Supervisor Profile:**

#### **Principal Supervisor:**

Dr. Engui Liu received his BSc degree in Materials Chemistry from Changzhou University, his MS in Materials Engineering from Tongji University, and his Ph.D. in Civil Engineering from New York University in 2014. After his Ph.D. completion at NYU, he joined the Engineering Division at New York University Abu Dhabi and served as Lecturer and Senior Lecturer in the Civil and Environmental Engineering program from 2013 to 2019. In Fall 2019, Dr. Liu returned to China and joined Xi'an Jiaotong-Liverpool University as an Assistant Professor of Civil Engineering. Dr. Liu works on green chemistries and the mechanics of cement and cementitious materials. He also focuses on multiscale materials' microstructural characterizations with advanced experimental and computational instruments.

#### **JITRI co-supervisor:**

Dr. Huang Shiyao is the Senior R&D Director of the Yangtze River Delta Institute of Advanced Materials. He received his Ph.D. from Shanghai Jiao Tong University in 2011. He was the R&D supervisor of Ford Motor's Nanjing Engineering Research Center and a senior research engineer at Midea's Manufacturing Technology Research Institute. His research interests include integrated computational materials engineering, materials big data, manufacturing digitalization, and whole life cycle assessment of material processing.

Dr. Weijian Han, Ph.D. in Mechanical Engineering, University of Tulsa, USA. He was the Director of R&D for Ford Motor Asia Pacific, where he has presided over and completed more than 100 Ford University R&D projects, published eight automotive engineering professional series, and published more than 40 academic papers in the areas of lightweight material manufacturing and simulation, characterization and testing, connectivity technology and simulation, intelligent manufacturing, sustainable energy system analysis and environmental science. In 2019, Dr. Han joined the Yangtze River Delta Institute of Advanced Materials as a business director, dedicated to constructing a big data platform for industrial application materials and developing data-driven algorithms and software.

### **How to Apply:**

Interested applicants are advised to email [engui.liu@xjtlu.edu.cn](mailto:engui.liu@xjtlu.edu.cn) and [huangsy@jitri-amrd.com](mailto:huangsy@jitri-amrd.com) the following documents for initial review and assessment (please put the project title in the subject line).

- CV
- Two reference letters with company/university letterhead
- Personal statement outlining your interest in the position
- Proof of English language proficiency (an IELTS score of 6.5 or above)
- Verified school transcripts in both Chinese and English (for international

students, only the English version is required)

- Verified certificates of education qualifications in both Chinese and English (for international students, only the English version is required)
- PDF copy of Master Degree dissertation (or an equivalent writing sample) and examiners reports available