JOB DESCRIPTION

Job Title: Lecturer / Senior Lecturer in Fire Modelling

Grade: AC2/AC3

Department: School of Computing and Mathematical Sciences

Responsible to: Director CSRPS

Responsible for: N/A

Key Contacts: Computing and Mathematical Sciences (CMS) Head of School, Faculty of Engineering and Science (FES) PVC, Colleagues in CSRPS, M34Impact, CMS and FES Colleagues in Greenwich Research and Innovation, Funding agencies, and Research Partners

Standard Occupational Classification (SoC code): 2311

Non-Contractual Nature of Role Profile: This role profile is non-contractual and provided for guidance. It will be updated and amended from time to time in accordance with the changing needs of the University and the requirements of the job.

PURPOSE OF ROLE

Our vision is to expand our world-leading Multi-Disciplinary and Multi-Scale Modelling expertise in both reach and ability, to tackle major societal challenges affecting the environment, quality of life, safety, security, and the economy. This will be achieved through the amalgamation and expansion of two existing award-winning teams: the Centre for Safety, Resilience and Protective Security (CSRPS) and the Computational Science and Engineering Group (CSEG), creating the Multi-scale, Multi-disciplinary Modelling for Impact ($M^3$4Impact) expansion.

These teams excel at developing and applying mathematical models, computational simulations and bespoke software to create digital worlds and representations that predict physically accurate outcomes addressing a wide range of societal challenges. $M^3$4Impact links three cross-cutting research and enterprise themes: **Safety and Security (S&S)**, covering disaster resilience, fire and evacuation dynamic coupling, urban-scale and building scale evacuation modelling, and protective security incorporating real-time interactivity through Virtual/Mixed Reality, led by CSRPS; **Materials Science and Engineering (MSE)**, focusing on sustainable manufacturing with lighter, stronger materials with broad applications in the transport, aerospace, energy and biomedical sectors; Using materials and process modelling to target recyclability, low waste and energy efficiency, led by CSEG; and **Digital Cities/London (DC)**, where interdisciplinary research will develop the evidence-base and capabilities to protect UK cities/populations from fire,

pollution, pathogen dispersal, natural/anthropogenic disasters and to support policy decision making.

This role lies within the remit of CSRPS's involvement within M^{3}4Impact and the **S&S** theme. It is intended to strengthen and expand the scope of CSRPS's capacity to conduct high-quality fire modelling related research. The CSRPS work theme covers a number of potential research areas, depending on the knowledge and skill set of the candidate and alignment with the strategic vision of CSRPS and the M34Impact programme, including Fire Modelling and Fire Safety Engineering, Disaster Resilience, Modelling of Indoor Air Quality (IAQ) - including modelling Airborne Pathogen Dispersion and Infection Risk, Virtual Reality (VR) and Virtual Training Environments (VTEs) for Emergency Response, and AI/LLM for Optimisation and Decision Support. This role will include the development of novel multi- disciplinary tools and methods such as the use of coupled fire and evacuation modelling to improve fire safety engineering accuracy and relevance, hybrid modelling approaches to couple multiple tools, e.g., for performance enhancement (e.g., coupled CFD-Zone-Network modelling) or to facilitate multi-physics analysis (e.g., coupled fire/materials modelling analysis for the prediction of failure of composite cladding materials), as well as the requirement to port our CFD fire modelling capabilities into a new software framework using high performance Lattice Boltzmann Methods (LBM). Underpinning these novel approaches to hybrid and multi-scale modelling will be numerical simulations utilising the University's High Performance Computing resources.

In its nature the role involves a highly collegiate approach and collaboration with other related M^{3}4Impact (**MSE** and **DC**) and CSRPS themes (e.g., evacuation modelling). The successful candidate will take a key role in promoting and supporting the further development and enhancement of our fire modelling suite of software, and its deployment on the university HPC & GPU based systems. The envisaged core research topics are broad in scope and will depend on the specifics of candidate-experience and could include:

- **Unstructured/Multi-Physics/Fire Modelling** – Modelling of combustion, flame spread over solid surfaces, toxic gas generation, and the impact of fire suppression systems on fire spread, hybrid CFD/zone/network-flow modelling of fire/IAQ/CBR hazards in complex and extensive environments for the purpose of incident response.
- **Emerging Safety Challenges** – CFD analysis/modelling of fire-risks and mitigations for rechargeable battery technology (e.g., domestic, car, aircraft, train, etc.), modelling waste storage fires including the physical modelling of fuel collapse/melting and fuel re-location.
- **Indoor Air Quality** – Response-to and impact-of wild-fire/chemical-spill plume and building infiltration/ingress, Ventilation design for sick building/pandemic and mitigations response, Development of guidance and procedural response for diverse indoor/infrastructure environments due to diverse threat scenarios.

- **Very Large-/Multi-Scale Hazard/Dispersal Modelling and towards Real-Time Processing** – Developing Lattice Boltzmann Methods (LBM) to significantly accelerate CFD based fire modelling on HPC systems with the aim to deliver real-time modelling in increasingly large-scale scenarios.
- **Application of Novel Technologies to Fire Safety Engineering applications** – Using VR to support enhanced training of first responders, and incorporating AI techniques to assist engineers in CFD fire modelling.

In conjunction with **CSRPS** agent-based evacuation and pedestrian modelling themes:

- Coupled real-time fire and evacuation modelling.
- Wildfire evacuation planning.
- Damage control on naval vessels.

In conjunction with the **DC** theme:

- Wildfire/Plume/Incident impact on city scale safety/evacuation.
- Development of workflows for multi-scale modelling of built-environment inside, outside and coupled.

In conjunction with **MSE** theme:

- Structural material behaviour in response to fire, e.g. melting.
- Combustion chemistry and pollution modelling in response to firefighting procedures.

Depending on the specific skills and capabilities of the successful candidate, the role may include some or all of the following activities:

- Contributing to developing new and enhanced algorithms describing a range of fire and IAQ related behaviours that can be incorporated within the **SMARTFIRE** suite of tools,
- Contributing to the enhancement and usability of the **SMARTFIRE** suite of fire and IAQ related models through the development of enhanced workflows, user interfaces and the adoption of HPC/cloud computing approaches,
- Contribute to expanding the capabilities of the **SMARTFIRE** suite of tools to include additional numerical and physical behaviours related to the candidate knowledge/skillset and the requirements and strategic vision of the group,
- Supporting the design and implementation of validation, training and educational material (including CPD and courses) related to the developed capabilities,

- Contribute to innovative model developments involving AI techniques or VR/MR and/or high-performance computing (including LBM) to enhance the fire and IAQ modelling capabilities.

The role includes involvement in enterprise and knowledge exchange (KE) activities in fire modelling and IAQ modelling, that make use of the **SMARTFIRE** suite of tools and other methodologies, as appropriate.

The ideal candidate will have a PhD in fire modelling (or a discipline related to the skills and themes mentioned above) and have experience of conducting research in a relevant subject plus a demonstrable track record of contributing to grant submission/acquisition. Knowledge/experience of laboratory fire experimental techniques is desirable. A strong track record of impactful publication in peer reviewed, international journals at the level of Lecturer/Senior Lecturer will be expected.

The focus of this position is on research and enterprise, but there would be a contribution to teaching and student supervision of up to 20%.

The post holder is expected to generate and maintain strong stakeholder relationships at regional, national and international levels, across their research disciplines.

KEY ACCOUNTABILITIES
Team Specific:

- Lead/contribute to subject or professional research resulting in the publication and/or dissemination of original work of international excellence quality.
- Contribute to and win significant research/enterprise bids for funding in support of the five-year strategy for M^{3}4Impact.
- Seek funding opportunities proactively to generate new research/enterprise and knowledge exchange income for CSRPS and M^{3}4Impact.
- Engage in interdisciplinary research collaboration and team building, within CSRPS, M^{3}4Impact, the Faculty and beyond.
- Engage in research or innovation consortia with external partners including non-academic stakeholders.
- Raising the CSRPS, M^{3}4Impact profile and establishing strong relationships with targeted clients and partners resulting in increased business.
- Protect and enhance CSRPS and M^{3}4Impact programme reputation, promoting its software tools, skills, and expertise to position it as a key partner of choice.
- Lead/contribute to the supervision of research students at doctoral level.

- Make significant contributions to the development of novel MSc programmes and CPD courses, integrating research, enterprise, and innovation, in support of teaching and knowledge exchange programmes developed as part of CSRPS and the $M^3$4Impact programme.

Generic:

- Lead/contribute to subject or professional research resulting in the publication and/or dissemination of original work of international excellence quality.
- Contribute to and win significant research/enterprise bids for funding in support of the five-year strategy for M34Impact.
- Seek funding opportunities proactively to generate new research/enterprise and knowledge exchange income for CSRPS and M34Impact.
- Engage in interdisciplinary research collaboration and team building, within CSRPS, M34Impact, the Faculty and beyond.
- Engage in research or innovation consortia with external partners including non-academic stakeholders.
- Raising the CSRPS, M34Impact profile and establishing strong relationships with targeted clients and partners resulting in increased business.
- Protect and enhance CSRPS and M34Impact programme reputation, promoting its software tools, skills, and expertise to position it as a key partner of choice.
- Lead/contribute to the supervision of research students at doctoral level.
- Make significant contributions to the development of novel MSc programmes and CPD courses, integrating research, enterprise, and innovation, in support of teaching and knowledge exchange programmes developed as part of CSRPS and the M34Impact programme.

Managing Self:

- Keep abreast of developments within the field and seek continuous improvement of own professional practice.
- Actively participate in established professional development framework activities.
- Behave in a manner that reflects the University values and creates a positive environment for work and study.

Core Requirements:

- Adhere to and promote the University's policies on Equality, Diversity and Inclusion and Information Security.

- Ensure compliance with Health & Safety and Data Protection Legislation.
- Support and promote the university's Sustainability policies, including the Carbon Management Plan, and carry out duties in a resource efficient way, recognising the shared responsibility of minimising the university's negative environmental impacts wherever possible.
- Adhere to current legal requirements and best practice relating to digital content and accessibility, including Web Content Accessibility Guidelines when creating digital content.

Additional Requirements:
Undertake any other duties as requested by the line manager or appropriate senior manager, commensurate with the grade.

This is a professional, demanding role within a complex organisation with an ambitious strategic plan and agenda for change. The role holder will be expected to show flexibility in working arrangements, including working hours, to ensure that School of Computing and Mathematical Sciences delivers the required level of service.

KEY PERFORMANCE INDICATORS:

- Performance Indicators will be established in consultation with the CSRPS director, the line manager, and other $M^3$4Impact Directors, as part of the post holder's annual Appraisal and Professional Development Review and with due regard to the University's KPIs.

KEY RELATIONSHIPS (Internal & External):

- Faculty Management Team.
- CSRPS management team.
- M34Impact Management Team.
- M34Impact Staff.
- Greenwich Research & Innovation (GRI).
- External funders and External Partners.

PERSON SPECIFICATION

EXPERIENCE:

Essential Criteria

- Leading and contributing to recognition and expertise in the field of CFD fire modelling with the ideal candidate having a substantial overlap with the research topics listed in the post role specification, including: (1) CFD Fire Modelling, (2) IAQ/CBR Modelling, (3) Coupled CFD/Zone/Network flow Modelling, (4) Lattice Boltzmann Method Modelling of Fire, and (5) Fire Chemistry, Fire Effluent Generation and Suppression Modelling (e.g., for rechargeable Li-Ion battery fires).
- Experience of using general CFD tools (e.g., COMSOL, Ansys CFX/Fluent, etc.) or fire-related CFD modelling or tools (e.g., SMARTFIRE, FDS, OpenFoam/FireFoam, etc.), for research and/or practical applications related to the project themes.
- Experience of developing/extending algorithms for CFD tools used for fire modelling, such as SMARTFIRE, FDS, OpenFoam / FireFoam, Fluent, etc. for research and/or practical applications.
- Demonstratable experience of computer programming in a structured language such as C++, C#, Python, Fortran, etc.
- Evidence of individual and/or collaborative income generation (Lecturer – desirable).
- Application for research funding and other bids (Lecturer – desirable).
- Proven track record of sustained academic publications with international impact (greater number expected for Senior Lecturer).
- Contribute to research and/or enterprise projects with a range of stakeholders, including commercial, government and public sector.
- Contribute to delivering impacts or outcomes with demonstrable benefits to businesses, the public sector, or society in general.
- Track record of supervision of research activities of students at various levels, including PhD. (Lecturer – desirable).

Desirable Criteria

- Knowledge and experience of fire safety regulations and standards.
- Knowledge and practical experience of laboratory based experimental fire techniques.
- Knowledge and practical experience of evacuation modelling.
- AI / LLM experience for decision support, process support or data analysis.
- Experience in the use of HPC and parallel computing techniques for large multi-scale simulations.

- Experience of teaching in HE, at a range of levels including undergraduate, masters and summer schools.
- Well-developed project management skills.
- Understanding of HE in the UK and in a business enterprise role.
- Working knowledge of quality assurance and academic standards.

SKILLS:

Essential Criteria

- Knowledge of the mechanisms of applying for research funds including the preparation of grant proposals. (Lecturer – desirable)
- Excellent organisational and management skills.
- Outstanding interpersonal skills and ability to work effectively with and motivate others.
- Excellent written and oral communication skills.
- Commitment to the promotion of high standards and excellence.
- Ability to think strategically and conceptually.
- Capacity to listen and consult, good negotiation skills.
- Capacity to make informed decisions.
- Ability to work effectively and deliver under pressure.
- Able to use IT effectively.

Desirable Criteria

- N/A

QUALIFICATIONS:

Essential Criteria

- PhD degree in a related field (to the themed research topics).

Desirable Criteria

- Postgraduate teaching qualification, e.g., PGCE.
- Associate Fellow of HEA or significant HE teaching experience.
- Membership of appropriate professional bodies such as, IFE, SFPE, IMA.

PERSONAL ATTRIBUTES:

Essential Criteria

- We are looking for people who can help us deliver the values of the University of Greenwich: Inclusive, Collaborative and Impactful.

Desirable Criteria

- N/A