

International vacancies for post-doctoral researcher position and other positions (Code: BRAV01)

Full-time, 40 hours per week – Duty station: Astana, Kazakhstan

Deadline for application: To qualify for full consideration, applications shall be submitted not later than 31 December 2023.

Project title: Buckling-resistant double- & multi-layered shells with complex topologies for aerospace and land vehicles (BRAVE)

Project description:

The BRAVE research programme will run between Jan 2024 and Dec 2026. The research topic lies at the intersection of computational mechanics, mechanics-based design, and (composite) materials. The research team aims to employ a new multifunctional egg-crate sandwich structural architecture for the design of complex and curved shell structures, with application to aerospace and high-speed rail engineering. The analysis results will be experimentally verified by high-speed dynamics experiments on a multi-DOF dynamic testing apparatus that will be designed under the same programme. The main FE computational platform for the composite structures will be Abaqus, supported by ANSYS or OpenFoam CFD for aeroelastic simulations. The research is targeting high-performance lightweight thin shell structures, incl. aircraft load bearing structures (wings, fuselage, winglets, floors and panels), rail carriage load bearing structures, rocket and satellite load bearing structures (frame, floors and panels) etc. There are 4 main objectives:

1. CAD and CAE parametric definition of the geometry of egg-crate composite structures (Solidworks/ Rhino/ CATIA, Abaqus). Creation of automated geometry generator algorithms and scripts.
2. Simulation of the structural deflections and stresses under static and dynamic conditions (Abaqus), as well as of full aeroelastic problems (ANSYS/ OpenFoam).
3. Design and development of multi-DOF test bed for replicating complex and transient load conditions (system in the loop), and
4. Fabrication of composite specimens for experimentally verifying and testing the analysis results and for technology demonstration (fibre-optic embedded sensing, laser vibrometry, high-speed photoelasticity)

Vacancy description:

As a successful applicant, you will join Nazarbayev University as a full time Research Assistant. You may also be required to spend specific periods of time at the School of Aerospace Engineering at the University of Nottingham in Ningbo, China, for fabrication of composite specimens and execution of tests. You will work closely with the research team on the geometrical and mechanical modelling of the investigated complex shell and sandwich geometries, also in consideration of complex external (and aeroelastic) loads. Knowledge of fundamental and computational mechanics and strong analytical and programming (scripting) skills are necessary for the position. In addition, you should be self-motivated and be able to integrate with a team of well-established researchers. Applicants for postdoctoral researcher position should have a PhD qualification in

a related field in engineering, physics or applied mathematics. Contracts for postdoctoral researchers range between 6 months (minimum) to 3 years (maximum), depending on performance.

After successful completion of the BRAVE programme, the recruited applicant(s) will be considered as a matter of priority for follow-up research projects by the BRAVE partners at the University of Nottingham in Ningbo China and/ or the BRAVE European partners.

Required qualifications, skills & competencies for a postdoctoral level researcher:

- A PhD degree in engineering, physics or applied mathematics.
- Excellent knowledge of topics pertaining to analytical and computational mechanics, machine dynamics, and related publication record.
- Strong mathematical background.
- Competent knowledge of structural FEA and CFD.
- Good programming skills (CAD scripting, FEA scripting).
- Fluent in oral and written communication in English. Competent academic writing.

Desirable skills and/or experience

- Good knowledge of Computer Aided Design packages (e.g., Solidworks/ Rhino), with emphasis on parametric modelling of complex forms.
- Good knowledge of Computer Aided Engineering packages (e.g., Abaqus, ANSYS/ OpenFoam).
- Machine design/ mechanical design
- Composites manufacturing and characterisation
- Structural testing and experimental characterisation of dynamical systems

A consideration will be also given to candidates, **BSc and MSc degree holders**, for research assistant positions and to candidates wishing to get admitted to NU University into a program leading to MSc or PhD degree.

Benefits: Modern campus facilities, in-house access to high performance computing cluster and microfabrication facilities, high speed camera, optical polariscope (reflective), SEM etc microstructural characterisation equipment, flexible working hours, low tax rate: the individual's income tax rate in Kazakhstan is 10%; the tax rate is simple, not progressive.

Supervision: Within this support and guidance framework by the project's PI and Co-PIs, a great degree of independence, within the programme objectives, will be offered. The successful candidate will be integrated into a larger international research team spanning the locations of Astana, Kazakhstan, and Ningbo, China, comprising mechanical and materials engineers, physicists, mathematicians, and chemical engineers.

Application: Please submit a full CV/Resume and a motivation letter to Dr. Andrey Melnikov (andrey.melnikov@nu.edu.kz) clearly indicating your relevant qualifications and aspirations. Reference letters (2) are not required at this stage of application, but they can be an asset.

Project partners



**University of
Nottingham**
UK | CHINA | MALAYSIA



**National Technical
University of Athens**