Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*)

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, Fakulteta za gradbeništvo in geodezijo (University of Ljubljana, Faculty of Civil and Geodetic Engineering)

2. Ime, priimek in elektronski naslov mentorja (*Mentor's name, surname and email*):

Jože Korelc, joze.korelc@fgg.uni-lj.si

3. Šifra in naziv raziskovalnega področja (*Research field*):

2.01 Gradbeništvo (Civil engineering), 2.05 Mehanika (Mechanics)

4. Kratek opis usposabljanja mladega raziskovalca (*Short description of the Young Researcher's training*):

Navedite tudi morebitne druge zahteve, vezane na usposabljanje mladega raziskovalca (npr. znanje tujih jezikov, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje…).

slo:
Bodoči mladi raziskovalec bo raziskovalno delo opravljal v okviru raziskovalne skupine Gradbene konstrukcije in gradbena fizika, ki pokriva področje numeričnega in eksperimentalnega modeliranja ter projektiranja jeklenih, masivnih in lesenih konstrukcij. Bodoči pristopi k načrtovanju konstrukcij bodo zahtevali materiale oziroma konstrukcijske sisteme, ki se bodo aktivno odzivali v času in prostoru na dane obremenitve. Razvoj metod aditivnih tehnologij (3D tiska) dandanes že omogoča izdelavo materialov in konstrukcij, ki imajo notranjo strukturo namensko zasnovano tako, da imajo optimalne lastnosti glede na namen. Za gradbeništvo je najbolj zanimiva uporaba metamaterialov in funkcionalno gradientnih materialov na področjih absorpcije energije, akustike, gradbene fizike, ter pametnih materialov in konstrukcij. Razvoj novih materialov in tehničnih rešitev poleg tega zahteva numeričen opis problemov na več skalah od nano, mikro do makro nivoja konstrukcije ter predvsem direktno upoštevanje vseh za odziv konstrukcije relevantnih fenomenov kot so imperfektnosti, zaostale napetosti in deformacije ter povezani fenomeni deformacij, prehoda toplote, pare in tekočin. Numerično modeliranje na več skalah ter modeliranje povezanih problemov v povezavi z metodami umetne inteligence je trenutno v samem središču razvoja numeričnih metod, saj predstavlja osnovo visokotehnoloških rešitev pri razvoju novih materialov in konstrukcij. Cilj usposabljanja bodočega mladega raziskovalca je s kombinacijo naprednega numeričnega modeliranja, 3D tiska ter eksperimentalne verifikacije razviti nove visokotehnološke konstrukcijske elemente. V okviru raziskovalne skupine je bilo razvito numerično orodje AceFEM, ki je na svetovnem nivoju eno vodilnih raziskovalnih orodij za razvoj novih materialov in konstrukcij. Programska skupina je tudi ena vodilnih raziskovalnih skupin na področju razvoja tehničnih standardov in eksperimentalnih metod pri analizi konstrukcijskih rešitev, kar bo dobra osnova za dosego zastavljenih ciljev. Dolgoletno sodelovanje z evropskim centri za aditivne tehnologije v tehniki pri Univerzi v Pavii, ter centrom za numerično modeliranje pri Univerzi v Hannovru bo dalo kandidatu možnost izvedbe dela usposabljanja v tujini. Splošnost uporabljenih numerično-eksperimentalnih metod, ter široka znanja v programski skupini bodo

omogočala kandidatu, da si, v dogovoru z mentorjem, izbere konkretne cilje in poudarke raziskav, ki bodo tako lahko osnova tudi za kandidatovo bodočo strokovno ali raziskovalno kariero. Vabljeni so kandidati s področja tehnike ali naravoslovja.

eng:
The future young researcher will perform research work within the research group Building Structures and Building Physics, which covers the field of numerical and experimental modeling and design of steel, concrete and wooden structures. Future approaches to structural design will require materials or structural systems that will actively respond in time and space to given loads. The development of methods of additive technologies (3D printing) nowadays already enables the production of materials and structures that have an internal structure purposefully designed so that they have optimal properties according to the purpose. The most interesting for construction is the use of metamaterials and functionally gradient materials in the fields of energy absorption, acoustics, building physics, and smart materials and structures. The development of new materials and technical solutions also requires a numerical description of problems on several scales from nano, meso to macro level of and especially direct consideration of all phenomena relevant to the design response such as imperfections, residual stresses and strains and coupled phenomena of deformation and transfer of heat, gasses and fluids. Numerical modeling on several scales and modeling of coupled problems in connection with artificial intelligence methods is currently at the heart of the development of numerical methods, as it represents the basis of high-tech solutions in the development of new materials and structures.

The goal of the training of the future young researcher is to develop new high-tech structural elements through a combination of advanced numerical modeling, 3D printing and experimental verification. Within the research group, the numerical tool AceFEM was developed, which is one of the world's leading research tools for the development of new materials and structures. The program group is also one of the leading research groups in the field of the development of technical standards and experimental methods in the analysis of structural systems, which will be a good basis for achieving the set goals. Long-term cooperation with the European centers for additive technologies in engineering at the University of Pavia, and the center for numerical modeling at the University of Hanover will give the candidate the opportunity to carry out part of the training abroad. The generality of the numerical-experimental methods used, as well as the broad knowledge in the program group will enable the candidate, in agreement with the supervisor, to choose specific goals and emphases of research, which can be the basis for the candidate's future professional or research career. Candidates in the field of engineering or natural sciences are invited.