

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

1. Raziskovalna organizacija (*Research organisation*):

Univerza v Ljubljani, Fakulteta za strojništvo

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

Davorin Kramar, davorin.kramar@fs.uni-lj.si

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

2.10 Proizvodne tehnologije in sistemi

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 angleškega jezika, izkušnje z laboratorijskim delom, potrebne licence za usposabljanje...).

slo:

Dodajne tehnologije (3D tisk) so v stalnem razvoju in so rastoč trg z izjemnimi napovedmi. Omogočajo izdelavo komponent za klasično izdelavo nepredstavljenih kompleksnosti in performanc. Kljub izjemnim lastnostim omenjene tehnologije včasih ne zagotavljajo tolerančnih zahtev določenih funkcionalnih delov oziroma karakteristik načrtane komponente. V teh primerih je komponente potrebno poobdelati s klasičnimi mehanskimi postopki. Ker se materiali (kovine) generirani na osnovi '3D tiska' po strukturi in mehanskih lastnosti večkrat močno razlikujejo od klasično pridobljenih materialov, je tudi obdelovalnost le teh bistveno drugačna. Obdelovalnost takih materialov trentuno še ni dovolj raziskana, popisana oziroma okarakterizirana. Poleg tega je klasične odrezovalne postopke mogoče nadgraditi v t.i. hibridne postopke. Hibridni postopki so obdelovalni postopki, kjer primarnemu procesu odrezavanja asistiramo z dodatnim sekundarnim, t.i. asistenčnim procesom, z drugim mehanizmom/energijo oz. orodjem, lahko v obliki visokotlačnega curka HMT, kriogenega medija, laserskega izvora, visoko-frekvančno vzbujanega orodja, abraziva ali magnetnega polja. Glavni cilj hibridizacije postopkov je izboljšanje obdelovalnosti zahtevnih materialov, med katere sodijo tudi komponente izdelane s '3D tiskom'.

Mladi raziskovalec/ka bo v svoji nalogi okarakteriziral obdelovalnost 3D tiskanih kovin. Preučil bo možnosti uporabe različnih hibridnih izdelovalnih postopkov, s ciljem izboljšanja obdelovalnosti teh materialov in dviga produktivnosti. Pri optimizaciji procesov bo uporabil metode načrtovanja eksperimentov in multi-kritrijske optimizacije empiričnih modelov. V času študija bo pridobil poglobljena znanja iz teorije gradiv, obdelovalnih postopkov, termodinamike, mehanike tekočin in merilne tehnike. Poleg eksperimentalnih pristopov bo pri svojem delu uporabljal numerične in analitične metode modeliranja.

Kompetence in pričakovanja od kandidata/ke:

- Osnovno poznavanje odrezovalnih postopkov
- Obvladovanje modeliranja v 3D prostoru
- Zanimanje za empirično, numerično in analitično modeliranje
- Dobro znanje angleškega jezika

eng:

Additive technologies (3D printing) are in constant development and are a growing market with exceptional forecasts. They enable the production of components for classical production of unimaginable complexity and performance. Despite the exceptional features of this technology, they sometimes do not provide tolerance requirements for certain functional parts or feature of the designed component. In these cases, the components must be finished by conventional mechanical procedures. Since materials (metals) generated on the basis of '3D printing' in terms of structure and mechanical properties often differ greatly from conventional materials, their machinability is also significantly different. The machinability of such materials has not yet been sufficiently researched, inventorized or characterized. In addition, conventional machining processes can be upgraded in so-called hybrid processes. Hybrid processes are machining processes where the primary cutting process is assist with an additional secondary, i.e. assisted process, with another mechanism/energy or tools, which could be in the form of high-pressure jet of CF, cryogenic media, laser source, high-frequency excited tool, abrasive or magnetic field. The main goal of the hybridization of processes is to improve the machinability of demanding materials, including components made with '3D printing'.

A young researcher will characterize the machinability of 3D printed metals in his thesis. He(she) will study the possibilities of using various hybrid manufacturing processes, with the aim of improving the machinability of these materials and raising productivity. In process optimization, he will use methods of experiment design and multi-criteria optimization of empirical models. During his studies, he will gain in-depth knowledge in material theory, machining processes, thermodynamics, fluid mechanics and measuring techniques. In addition to experimental approaches, he will use numerical and analytical methods of modeling in his work.

Competencies and expectations of the candidate:

- Basic knowledge of machining processes
- Skills in 3D modeling
- Interest in empirical, numerical and analytical modeling
- Good knowledge of English