

I. Personal and study details

Student's name: **Ullrich Jakub** Personal ID number: **483943**
Faculty / Institute: **Faculty of Mechanical Engineering**
Department / Institute: **Department of Production Machines and Equipment**
Study program: **Robotics and Production Machines**
Specialisation: **Production Machines**

II. Master's thesis details

Master's thesis title in English:

A multiparametric model of cutting forces for virtual machining simulations

Master's thesis title in Czech:

Multiparametrický model ezných sil pro virtuální simulace obrábění

Guidelines:

Cutting forces during machining depend on a number of parameters of the tool geometry and cutting conditions. The goal of the work is the design and verification of a simplified cutting force multiparametric model and its application for accurate predictions of machining errors during virtual machining. Structure: 1. Research approaches and methods to modeling and simulations of cutting forces and the use of process digital twins; 2. Analysis of existing multiparametric models of cutting forces; 3. Proposal of an innovative multiparametric model of cutting forces including the effect of cutting edge radius; 4. Implementation of the proposed model into the virtual machining simulation and a comparison of the simulation results with the measurement; 5. Application of the model for the prediction of static errors during machining.

Bibliography / sources:

- [1] LAŠOVÁ, V. Základy stavby obráběcích strojů. Západočeská univerzita v Plzni, Plzeň, 2012
- [2] ALTINTAS, Y. Manufacturing automation: metal cutting mechanics, machine tool vibrations, and CNC design. 2nd. New York: Cambridge University Press, 2012
- [3] ALTINTAS, Y., KERSTING, P., BIERMANN, D., BUDAK, E., DENKENA, B., & LAZOGLU, I. Virtual process systems for part machining operations. CIRP Annals, 63(2), 585–605, 2014.
- [4] ASTAKHOV, Viktor P. Cutting Force Modeling: Genesis, State of the Art, and Development. In: DAVIM, J. Paulo, ed. Mechanical and Industrial Engineering [online]. Springer International Publishing, 2022

Name and workplace of master's thesis supervisor:

Ing. Matěj Sulitka, Ph.D. Department of Production Machines and Equipment FME

Name and workplace of second master's thesis supervisor or consultant:

Mgr. Jiří Falta Department of Production Machines and Equipment FME

Date of master's thesis assignment: **14.04.2023** Deadline for master's thesis submission: **24.07.2023**

Assignment valid until: **24.09.2023**

Ing. Matěj Sulitka, Ph.D.
Supervisor's signature

doc. Ing. Petr Kolář, Ph.D.
Head of department's signature

doc. Ing. Miroslav Španěl, CSc.
Dean's signature

III. Assignment receipt

The student acknowledges that the master's thesis is an individual work. The student must produce his thesis without the assistance of others, with the exception of provided consultations. Within the master's thesis, the author must state the names of consultants and include a list of references.

Date of assignment receipt

Student's signature