University *of Ljubljana*
Faculty *of Mechanical Engineering*

Advanced Machining Processes 5 ECTS

Lecturer: **F. Pušavec**

Lectures: 30h | Tutorials: 12h | Labs: 18h | Project: 0h | Lang. :

Objectives

The objectives of this course are to make the students aware of the new trends in machining and manufacturing processes and the future challenges. In order to be competitive in a global industrial environment, transition to sustainable and green machining and production processes appears as a key step. This implies that each segment of machining processes involved in this chain has to be considered to be transformed, raising strong scientific and technical questions to be answered.
This course will thus browse:

- The context in which the principles of machining will be connected with whole production processes.
- The requirements for modelling and optimization of the machining, as well as manufacturing processes.
- The characterisation of the main input data with a special emphasis on energy efficiency and environmental footprint.
- How to build a strategic approach to prepare the technological/economical plan and quality of the process.

Programme

Basic tool kinematics and chip formation, Basic tool kinematics and chip formation, Defined cutting geometry, Chip formation models, Determination of machining efficiency, Cutting forces, Undefined cutting geometry, Tool-wear and tool-life, Cutting tools, Cutting tool coatings, Cooling and lubrication of machining processes, Productivity and economy, Optimization of machining processes, Special/modern machining processes, Guest lecture by an expert from industrial environment.

Prerequisites

In order to successfully achieve this course, the students must have:

- Meeting the enrolment conditions for the Master's study programme of Mechanical Engineering - Research and Development program
- Good knowledge in mechanics of materials (elastic-plastic behaviour)
- Basic knowledge in heat transfer.

Learning outcomes

After attending this course, the student will obtain:

- Knowledge and management skills of demanding/complex machining processes, and methodological tools for modelling / predicting behaviour.
- Designing machining technologies skills based on problem solving.
- Ability to reflect critically and innovate upgrades

Assessment

Contribution to the final grade:

- 50% theoretical written exam with the mutual exam.
- 30% laboratory work with the short evaluation/reports.
- 20% seminar work as home assignment (oral presentation in groups with self-assessment by the classmates). The topic will be related to one of the key aspects from the course.

Literature

Y. Altintas: Manufacturing Automation: Metal Cutting Mechanics, Machine Tool Vibrations, and CNC Design, 2012, Cambridge University Press.
J. Kopač: Odrezavanje – Teoretične osnove in tehnološki napotki, 2008, Ljubljana.
F. Klocke: Manufacturing Processes 1. Springer-Verlag Berlin, 2011 4.
F. Pušavec, J. Kopač: Sustainability of modern metal cutting processes: assessment of cryogenic machining. Ljubljana, 2012.
G. Globočki-Lakić, D. Kramar, J. Kopač: Metal cutting: theory and applications. Banja Luka, Ljubljana, 2014.
J. Paulo Davim, Machining - Fundamental and recent advances, Springer, 2008.