Course syllabus

Skärande bearbetning, fortsättningskurs
Metal Cutting, Advanced Course

MMTN40, 7,5 credits, A (Second Cycle)

Valid for: 2023/24
Faculty: Faculty of Engineering, LTH
Decided by: PLED M
Date of Decision: 2023-04-11

General Information

Main field: Production and Materials Engineering.
Elective for: M4, MPRR1
Language of instruction: The course will be given in English on demand

Aim

To achieve a more thorough understanding and competence in the field of metal cutting. The achieved knowledge should also result in a possibility for an active participation in research and development within the field of machining.

Learning outcomes

Knowledge and understanding
For a passing grade the student must

- be able to describe and discuss fundamental metal cutting theory.
- be able to analyse and describe the interaction between the mechanical, thermal and tribological loads on the cutting tool.
- be able to show an understanding for basic calculations regarding the interaction between load ratio, cutting tool material and cutting tool geometry.
- be able to, in general, analyse a cutting process and direct efforts of development for cutting tool and work piece material in order to achieve an improved quality or a reduced machining cost.
- be able to show an understanding of the existing principles for the measuring of e.g. static and dynamic cutting forces and cutting tool movements.

- be able to show an understanding of today's research areas regarding metal cutting.

Competences and skills
For a passing grade the student must

- be able to develop cutting tests for specific purposes such as evaluation of wear resistance, plastic deformation and deterioration behaviour of cutting tools or estimate the machinability of a work piece material in one or more applications.

Contents

A large part of the course is carried out with computer tools, such as MathCad, for the simulation of the metal cutting process.

The compulsory written assignments contain experimental elements.

The course includes the following: The Production Reliability concept and the application on metal cutting. Basic metal cutting considerations. Tool deterioration and consequences. Modelling of mechanical loads, cutting resistance, load relation functions, load variation functions etc. Comparison of material properties. Thermal analysis and modelling of the cutting process. Stress calculations and stress analysis on cutting edges. Work material structures and machinability. Tool deterioration, tool wear and wear models, cracking, fracture, plastic deformation and chemical degradation. Testing of cutting tools and tool properties, tool characteristics. Multi-tooth cutting processes, load interference and load interaction. Measurement of cutting forces and development of cutting force sensors. Process dynamics, segmentation etc. Vibrations and instability, process damping and the relation to tool geometry. Micro geometries and dynamics. Active tool damping and control.

Examination details

Grading scale: TH - (U,3,4,5) - (Fail, Three, Four, Five)
Assessment: Written exam and written assignments.

The examiner, in consultation with Disability Support Services, may deviate from the regular form of examination in order to provide a permanently disabled student with a form of examination equivalent to that of a student without a disability.

Admission

Assumed prior knowledge: MMT031/MMTN25 Production Technology or corresponding course.
The number of participants is limited to: No

Reading list

- Ståhl, J.-E.: Metal Cutting, Theories and models. SECO TOOLS, 2012.

Contact and other information

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