GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

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| Subject name and code | Efficiency and quality of machining processes, PG_00064727 | | | | | | |
| Field of study | Management and Production Engineering | | | | | | |
| Date of commencement of studies | February 2025 | | Academic year of realisation of subject | 2025/2026 | | | |
| Education level | second-cycle studies | | Subject group | Specialty subject group<br>Subject group related to scientific research in the field of study | | | |
| Mode of study | Full-time studies | | Mode of delivery | at the university | | | |
| Year of study | 1 | | Language of instruction | Polish | | | |
| Semester of study | 2 | | ECTS credits | 4.0 | | | |
| Learning profile | general academic profile | | Assessment form | exam | | | |
| Conducting unit | Zakład Technologii Maszyn i Automatyzacji Produkcji -> Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology | | | | | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | | dr hab. inż. Daniel Chuchała | | | | |
| | Teachers | | | | | | |
| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
| | Number of study hours | 15.0 | 0.0 | 15.0 | 15.0 | 0.0 | 45 |
| | E-learning hours included: 0.0 | | | | | | |
| Learning activity and number of study hours | Learning activity | Participation in didactic classes included in study plan | | Participation in consultation hours | Self-study | SUM | |
| | Number of study hours | 45 | | 14.0 | 41.0 | 100 | |
| Subject objectives | The aim of the course is to get acquainted with issues of process modeling and operation of cutting tools inmanufacturing processes. Learn about the construction and application of various tool systems and theirinfluence on the quality and efficiency of processes. Methods and means of selection and analysis of theimplementation of processes on machine tools. | | | | | | |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
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| [K7_U04] creatively designs or modifies, in whole or at least in part, production and technological systems and processes, in accordance with the given specifications, taking into account technical and non-technical aspects, estimating costs and using known design techniques appropriate for tasks in the field of Management and Production Engineering | Students will be able to design a manufacturing process based on the energy requirements of the manufacturing process. | [SU4] Assessment of ability to use methods and tools<br>[SU1] Assessment of task fulfilment |
| [K7_K12] is ready for fullfiling social commitement and initation of actions for public interest including entrepreneurial thinking and acting | The student is able to identify environmental risks and select appropriate process conditions to reduce them. | [SK5] Assessment of ability to solve problems that arise in practice<br>[SK3] Assessment of ability to organize work |
| [K7_W04] demonstrates knowledge covering selected issues in the field of advanced detailed knowledge, in particular in the field of methods, techniques, tools and algorithms used in production management and control processes as well as in the design of technological processes | The student is able to use mathematical models to determine the energy properties of the cutting process and the parameters of the chip formation process in the cutting process. | [SW3] Assessment of knowledge contained in written work and projects<br>[SW1] Assessment of factual knowledge |
| [K7_W12] identifies and interprets the main developmental trends and significant new achievements in the field of engineering and technical sciences and disciplines relevant to the course of study | The student is able to obtain information on the cutting tools, cutting parameters of machining processes using web and mobile tools. | [SW1] Assessment of factual knowledge |

## Subject contents

LECTURE:General characteristics and classification of materials for cutting edges of tools withdefinedcuttingedge. Causes of wear, geometrical factors of wear, physical and technological bluntnessfactors of ablade.Wear in time (tool life, wear of cutting tool blades in interrupted machining). Principles ofblademateriallselection. Tool loading - energy properties of machining process. Cutting forces - methods offorceestimationbased on model taking into account specific cutting resistance and elements of modernfracturemechanics(Atkins's model). Models for determining shear angle in cutting zone. Tooling systemoverview(ISO, HSK,CAPTO, etc.). Principles of tool and insert selection. Methods of measuring cuttingedge wear.Vibrations incutting process. Dynamic stiffness of tools with low inherent stiffness. Economicefficiency andoptimization ofmachining process.LABORATORY: Geometry of cutting edge. Construction ofmodern cutting tools. Study of influence ofcuttingedge geometry on surface roughness in turning. Wear andtear of cutting edges. Computer aidedselectionof cutting tools. Static stiffness. Determination of criticalspeeds of tools with low inherent stiffness.Tool costanalysis.PROJECT:Prediction of energy conditions for a selected machining process

## Prerequisites and co-requisites

Basic knowledge of machining, machine tools and cutting tools and manufacturing techniques

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Laboratory exercises | 100.0% | 10.0% |
| Final exam | 56.0% | 80.0% |
| Project exercises | 100.0% | 10.0% |

## Recommended reading

Basic literature

1. Grzesik W.: Advanced machining processes of metallic materials.Theory, modelling and applications. Elsevier, 2017.

2. Cichosz P.: Narzędzia skrawające. WNT, 2006.

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| | Supplementary literature | 1. Markopoulos A.P.: Finite element method in machining processes. Springer, London, 2013.<br><br>2. Training handbook. Metal cutting technology. C-2920:40 en-GB © AB Sandvik Coromant 2017.11 |
| | eResources addresses | Adresy na platformie eNauczanie: |
| Example issues/ example questions/ tasks being completed | List and describe measures of tool cutting edge wear according to PN-ISO standard. The effect of cutting parameters on cutting edge life. | |
| Work placement | Not applicable | |

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