GDAŃSK UNIVERSITY OF TECHNOLOGY

Subject card

| | | | |
|---|---|---|---|
| Subject name and code | Modelling and analysis of cutting tool systems, PG_00059374 | | |
| Field of study | Mechanical Engineering | | |
| Date of commencement of studies | February 2024 | Academic year of realisation of subject | 2024/2025 |
| Education level | second-cycle studies | Subject group | Optional subject group<br>Subject group related to scientific research in the field of study |
| Mode of study | Part-time studies | Mode of delivery | at the university |
| Year of study | 1 | Language of instruction | Polish |
| Semester of study | 2 | ECTS credits | 3.0 |
| Learning profile | general academic profile | Assessment form | assessment |
| Conducting unit | Institute of Manufacturing and Materials Technology -> Faculty of Mechanical Engineering and Ship Technology | | |
| Name and surname of lecturer (lecturers) | Subject supervisor | prof. dr hab. inż. Kazimierz Orłowski | |
| | Teachers | | |

| Lesson types and methods of instruction | Lesson type | Lecture | Tutorial | Laboratory | Project | Seminar | SUM |
|---|---|---|---|---|---|---|---|
| | Number of study hours | 18.0 | 0.0 | 9.0 | 0.0 | 0.0 | 27 |
| | 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 | 27 | 7.0 | 41.0 | 75 |

| Subject objectives | |
|---|---|
| | The aim of the course is to get acquainted with issues of process modeling and operation of cutting tools in manufacturing processes. Learn about the construction and application of various tool systems. Methods and means of selection and analysis of the implementation of processes on machine tools. |

## Learning outcomes

| Course outcome | Subject outcome | Method of verification |
|---|---|---|
| [K7_U06] when solving engineering problems on design, technology and operation of machines is able to assess and classify typical methods and tools, define systemic and ex-technical aspects using modern calculating methods and design tools or modifying the current ones | Students understand the phenomena occurring in the cutting zone, know the basic models of chip formation. He is able to evaluate energy effects of the machining process. | [SU2] Assessment of ability to analyse information<br>[SU3] Assessment of ability to use knowledge gained from the subject |
| [K7_W06] possesses organized, profound knowledge necessary for designing and optimization of complex technological processes, modelling and calculations using numerical methods, knows modern manufacturing methods and tools for designing manufacturing processes of machines, devices, their elements and components | Students is able to classify manufacturing methods and distinguish between different types of means, equipment and tools used in manufacturing. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |
| [K7_W11] possesses organized knowledge useful in understanding ex-technical conditioning connected with performing the profession of an engineer and taking it into consideration in engineering practice; possesses well-established knowledge within the range of intellectual property, management and organization of manufacturing processes, including the management and life-cycle of a product | The student knows criteria and algorithms for optimizing the selection of cutting conditions. He/she can create an economic model and a performance model. | [SW1] Assessment of factual knowledge<br>[SW3] Assessment of knowledge contained in written work and projects |

## Subject contents

LECTURE:General characteristics and classification of materials for cutting edges of tools with definedcutting edge. Causes of wear, geometrical factors of wear, physical and technological bluntness factors of ablade. Wear in time (tool life, wear of cutting tool blades in interrupted machining). Principles of blademateriał selection. Tool loading - energy properties of machining process. Cutting forces - methods of forceestimation based on model taking into account specific cutting resistance and elements of modern fracturemechanics (Atkins's model). Models for determining shear angle in cutting zone. Tooling system overview(ISO, HSK, CAPTO, etc.). Principles of tool and insert selection. Methods of measuring cutting edge wear.Vibrations in cutting process. Dynamic stiffness of tools with low inherent stiffness. Economic efficiency andoptimization of machining process.LABORATORY: Geometry of cutting edge. Construction of modern cutting tools. Study of influence of cutting edge geometry on surface roughness in turning. Wear and tear of cutting edges. Computer aided selectionof cutting tools. Static stiffness. Determination of critical speeds of tools with low inherent stiffness. Tool cost analysis.

## Prerequisites and co-requisites

## Assessment methods and criteria

| Subject passing criteria | Passing threshold | Percentage of the final grade |
|---|---|---|
| Practice exercises | 100.0% | 10.0% |
| Control test | 56.0% | 90.0% |

## Recommended reading

Basic literature

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

| | | |
|---|---|---|
| | Supplementary literature | 1. Markopoulos A.P.: Finite element method in machining processes. Springer, London, 2013.2. 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 cuttingparameters on cutting edge life. | |
| Work placement | Not applicable | |