COURSE DESCRIPTION CARD - SYLLABUS

Course name

Selection of cutting tools and parameters

Course

Field of study

Mechanical Engineering

Year/Semester

4/8

Area of study (specialization)

-

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

part-time

Requirements

compulsory

Number of hours

Lecture

8

Laboratory classes

8

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr inż. Marek Rybicki

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Responsible for the course/lecturer:

Prerequisites

1) Student has elementary knowledge of mathematics, physics, mechanics, machining, cutting tools and equipment.

2) Student can utilize acquired knowledge for selection of cutting tools and calculation of cutting parameters as well as can take advantage of information from library and Internet.

3) Student is independent in solving problems, acquiring and improvement of knowledge and skills, understand necessity of learning.

Course objective

Acquaintance with latest cutting tools (geometry, operational properties) and the method of selection and calculation of cutting parameters.

Course-related learning outcomes

Knowledge

1. Has knowledge necessary to use a mathematical apparatus to describe mechanical problems, structures and technological processes.

2. Has knowledge necessary knowledge for analyzing physical phenomena and solving technical problems based on the laws of physics.

3. Has structured, theoretically proven knowledge of materials strength.

4. Has basic knowledge of computer systems for engineering support in mechanics, machine construction and engineering as well as product preparation.

5. Has knowledge in materials science with elements of chemistry including natural and engineering materials (comparison of their structure, properties and applications), principles of selection of engineering materials in machine construction.

6. Has detailed knowledge of manufacturing techniques to enable the use of manufacturing technology to shape the form, structure and properties of the products.

Skills

1. Can obtain information from literature, databases and other properly selected sources (also in English) in the field of mechanics and machine construction and other engineering and technical issues in line with the field of study; It can integrate the information obtained, interpret it, draw conclusions and formulate and justify the opinions.

2. Can select engineering materials for mechanical and machine engineering applications.

3. Can select and apply production technologies to shape the form, structure and properties of products, design technological processes along with the selection of technological machinery, tools and equipment as well as their organization.

4. Can perform a preliminary economic analysis of undertaken engineering activities; Can assess the economic conditions of the use of various materials, technologies and test methods.

Social competences

1. Correctly identifies and resolves dilemmas related to the profession.

2. He can think and act in an entrepreneurial way.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written examination (in case of answer on: from 50 to 60% questions – satisfactory, above 60

to 70% – satisfactory plus, above 70 to 80% – good, above 80 to 90% – good plus, above 90 to 100% – very good grade)

Classes: Written credit at the end of semester. In case of solving: from 50 to 60% problems – satisfactory, above 60 to 70% – satisfactory plus, above 70 to 80% – good, above 80 to 90% – good plus, above 90 to 100% – very good grade. Absence from the classes must not cross 1/3 to pass it.

Programme content

1. Introduction: kinematics, technological and geometrical parameters for various machining methods

2. Selection examples of cutting tools and conditions (kind, dimensions, edges number, geometry and placing of cutting toll, cutting parameters) for the sake of various criterions (roughness and jagged edges of machined surface, forces, chatter, material removal rate and tool cost).

3. Selection of tool materials and wear resistant coatings for various technological tasks and work materials – real results of tool life tests.

4. Changes of tools geometry during cutting – choosing of federate for the sake of lateral clearance angle in working layout.

5. Allowance (depth of cut) dividing in consecutive passes and strategy of its removing. Kowan formula.

6. Selection of feedrate and cutting depth from diagrams of correct chips braking.

7. Impact of kinematic-geometrical mapping, plastic and elastic deformations, edges runout, chatter, chips edge burrs on machined surface roughness. Bramertz formula.

8. Selection of machining parameters for the sake of cutting forces, moment and power. Cases of the forces variability during various machining methods and mean force calculation. Method of material removal rate calculation for any machining method and its utilization for calculation of cutting power. Constraints of machine tools and using of their motors characteristics.

9. Choosing of cutting speed from viewpoint of tool life. Taylor formula and attitude of tool producers to correction of cutting speed considering the tool life.

10. Economic and productive cutting speed and tool life. Combination of cutting depth and feedrate for constant cutting speed allowing maximal materials removal rate or tool life. Unit cost of machining.

11. Multi criteria selection of cutting parameters. Criterion of simultaneous full utilization of machine tool and certain tool life, criterion of maximal removal rate and fulfilment of two other constraints (linear programming method).

12. Indicators enable multi-criteria selection of machining parameters: ratio of unit cost to material removal rate, product of tool life and material removal rate, ratio of cutting power to material removal rate etc.

13. Systems and calcuators simplifying to choice of cutting tools and parameters (TDM, WinTool, Secolor, GuhringNavigator etc.)

Teaching methods

Presentation, exercises, work with catalogs

Bibliography

Basic

1. Kawalec M.: Ćwiczenia z podstaw skrawania. Skrypt 1138, Wydawnictwo Politechniki Poznańskiej 1983.

2. Praca zbiorowa: Poradnik Inżyniera. Obróbka skrawaniem – tom 1 i 2. WNT, Warszawa 1991.

3. Olszak W., Obróbka skrawaniem, WNT, Warszawa, 2008

4. Cichosz P., Narzędzia skrawające, WNT, Warszawa, 2006

5. Przybylski L., Strategia doboru warunków obróbki współczesnymi narzędziami. Toczenie - wiercenie - frezowanie. Wyd. II, Z-d Graficzny Politechniki Krakowskiej, Kraków, 2000

6. Materiały firm narzędziowych

Additional

1. Grzesik W., Podstawy skrawania materiałów konstrukcyjnych, WNT 2010

2. Krzyżaniak S., Kawalec M., Optymalizacja parametrów skrawania w obróbce jedno- i wielonarzędziowej, Wydawnictwo Politechniki Poznańskiej, Poznań 1985

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,0
Classes requiring direct contact with the teacher	21	0,8
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	0	0,0

[1] delete or add other activities as appropriate