



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Design of special tools [S2MiBM2-INPR>PNS]

Course

Field of study

Mechanical Engineering

Year/Semester

1/2

Area of study (specialization)

Production Engineering

Profile of study

general academic

Level of study

second-cycle

Course offered in

Polish

Form of study

full-time

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

0

Other

0

Tutorials

0

Projects/seminars

15

Number of credit points

2,00

Coordinators

dr inż. Zbigniew Nowakowski

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Lecturers

Prerequisites

Basic scope of machining operations types and its kinematics, design and geometry of cutting tools. The ability to operate a computer and CAD systems, using information obtained from various sources.

Course objective

To prepare the student for tool-conscious activity, the implementation of new solutions and the construction of special tools. Fostering basic technical problem solving skills and independently carrying out assignments based on acquired knowledge.

Course-related learning outcomes

Knowledge:

The student knows how to characterize technological capabilities of different cutting tools.

The student knows how to name and define basic geometrical features of cutting tools.

The student knows how explain influence of cutting parameters of effects of machining process.

The student knows how calculate basic physical and geometrical problems in machining.

Skills:

The student is capable of selecting proper geometry and cutting material for cutting tool.
The student is capable of verifying previously assumed cutting parameters based on cutting conditions.
The student is capable of proposing a concept for special cutting tool design for given machining operation.
The student is capable of using CAD system for designing cutting tool.

Social competences:

The student acquires creative thinking skills.

The student is aware of the importance of IT solutions for contemporary manufacturing industry.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

The knowledge acquired in the lectures is verified at the end of the semester in an oral form. The interview consists of questions on the calculation and design methodology of special tools.

The skills acquired in the project are successively verified in classes during the presentation and discussion of the next stages of the project. The technological, calculation and construction documentation of the project prepared by the student is also assessed.

Programme content

1. Selection of tools and cutting parameters for the machining.
2. Verification of cutting parameters based on various criteria.
3. Stages of designing special tools.
4. Designing cutting tools with indexable inserts.

Course topics

Scope of lecture:

- methods of classifying workpiece material by its machinability,
- selection of the cutting tool for the machining process - selection of material and geometry of the cutting edge, practical effects that determine the selection of the cutting edge geometry,
- selection of cutting parameters for preliminary machining - practical methods of calculating components of the total force and cutting power,
- selection of cutting parameters for finishing machining - geometric and kinematic mapping of the cutting wedge in the working material, influence of the cutting edge geometry and cutting parameters on the surface structure and machining accuracy,
- the importance of special cutting tools in the machinery industry,
- stages of designing special cutting tools - shape, number, accuracy and arrangement of inserts, ways of avoiding collision of the cutting wedge with the material worked, construction of the insert socket,
- the basis for designing a drill with indexable inserts - selection and optimisation of the shape, number and geometry of the cutting edges according to different criteria,
- the basis for designing a milling cutter with indexable inserts - selection and optimisation of the shape, number and geometry of the cutting edges according to different criteria.

Scope of project:

- formulation of concept for set of operations resulting in machined part in accordance to initial premises and engineering drawing. This concept must include: selection of tools and cutting parameters, verification of cutting parameters on grounds of cutting conditions,
- formulation of concept for special cutting tool (with standardized inserts) for given complex machining operation. This concept must include: selection of inserts, dimensional and geometrical analysis, insert position in tolerance range, collision analysis, engineering drawing of special tool.

Teaching methods

Lecture: multimedia presentation illustrated with examples, design calculations, discussion.

Project: student's own work, presentation of subsequent stages of the project during classes, project consultations, discussion.

Bibliography

Basic:

Cichosz P., Narzędzia skrawające. Wydawnictwa Naukowo-Techniczne, Warszawa 2006.
 Meldner B., Darlewski J., Narzędzia skrawające w zautomatyzowanej produkcji. Wydawnictwa Naukowo-Techniczne, Warszawa 1991.
 Olszak W., Obróbka skrawaniem. WNT, Warszawa 2008, 2009.
 Przybylski L., Strategia doboru warunków obróbki współczesnymi narzędziami. Toczenie - wiercenie - frezowanie. Wyd. II, Z-d Graficzny Politechniki Krakowskiej, Kraków 2000.
 Katalogi firm narzędziowych.

Additional:

Kawalec M., Ćwiczenia z podstaw skrawania. wyd. II Wydawnictwo Politechniki Poznańskiej. Poznań 1984.
 Stephenson D.A., Agapiou J.S., Metal cutting. Theory and practice. Second edition. CRC Press Taylor & Francis Group. 2006.

Breakdown of average student's workload

	Hours	ECTS
Total workload	50	2,00
Classes requiring direct contact with the teacher	30	1,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	20	1,00