COURSE DESCRIPTION CARD - SYLLABUS

Course name
Subtractive manufacturing [S1ZiIP2>TeU2]

Course

Field of study
Management and Production Engineering

Year/Semester
1/2

Area of study (specialization)
–

Profile of study
general academic

Level of study
first-cycle

Course offered in
Polish

Form of study
full-time

Requirements
compulsory

Number of hours

Lecture
30

Laboratory classes
15

Other
0

Tutorials
0

Projects/seminars
0

Number of credit points

4,00

Coordinators

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Lecturers

Prerequisites

Basic knowledge of the methods and kinematics of cutting, the cutting tools used and the construction of machine tools. The ability to operate simple technical devices, capability of making use of information retrieved from different sources.

Course objective

Practical knowledge of technological and physical aspects of machining, tool materials and geometry of cutting tools. Fostering basic problem solving skills and independently carrying out assignments based on acquired knowledge.

Course-related learning outcomes

Knowledge:
The student has basic knowledge of waste technologies used in the machine manufacturing process.

Skills:
The student is able to define the scope of application for a given subtractive manufacturing.
The student is able to select proper technology to manufacture given part and can justify his/her choice.

The student is able to characterize given manufacturing technology and can describe its pros and cons.
The student is able to perform initial economical analysis of manufacturing technology in given case.

Social competences:
The student is aware of the relationship between human resources management and non-technical aspects of his/her work, including responsibility for the decisions he/she makes.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture:
final exam from lecture material at the end of the semester (pass if you obtain at least 50.1% of the correct answers). <90-100> very good; <80-90) good plus; <70-80) good; <60-70) satisfactory plus; <50-60) satisfactory; <0-50) unsatisfactory.
Laboratory classes:
credit is awarded based on oral questioning and/or written test checking knowledge on the subject of laboratory exercise, reports from each laboratory exercise with accordance to given guidelines.

Programme content

1. Review of subtractive technologies and their application in industry.
2. Kinematics and cutting parameters.
3. Structure and materials used for cutting tool wedges.
4. Technological effects of machining and physical phenomena occurring in the cutting process.
5. Economics of the machining process.

Course topics

Scope of lecture:
- characteristics and application of machining in contemporary manufacturing,
- methods and types of machining, cutting kinematics,
- contemporary materials for cutting wedges and cutting tools, anti-wear coatings,
- cutting wedge geometry and the machining process and effects,
- mechanics of the cutting process - minimum thickness of the cutting layer, chip shaping,
- selected physical phenomena occurring in the cutting process (heat, diffusion, adhesion, friction),
- energy issues: cutting forces, power and moments,
- machinability of construction materials,
- tribological considerations in the tool operation process - wear, durability and reliability of tool wedges,
- processed surface and its geometric condition - characteristics of the surface layer and its role in modern technology,
- economics and optimization of the cutting process,
- modern technologies for subtractive manufacturing (HM, HSM, HPC, DM, MQL, etc.),
- erosion machining.

Scope of laboratory classes:
- comparison of the cutting ability and econamical performance of different cutting materials,
- evaluation of geometric characteristics of surface layer subjected to different types of machining,
- evaluation of machinability of different materials based on force and temperature measurement,
- evaluation of feed force and cutting torque during drilling operation,
- tools and cutting materials for cutting wedges.

Teaching methods

Lecture: multimedia presentation illustrated with examples given on the blackboard, solving problems.
Laboratory classes: performing experiments, solving problems, discussion, working in a team.

Bibliography

Basic:
Adamczak S., Pomiary geometryczne powierzchni. Zarysy kształtu, falistości i chropowatości., WNT, Warszawa 2008.

Filipowski R., Marciniak M.: Techniki obróbki mechanicznej i erozyjnej. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000.
Praca zbiorowa pod red. Laber A., Wybrane zagadnienia z inżynierii wytwarzania. Obróbka ubytkowa. Oficyna Wydawnicza Uniwersytetu Zielonogórskiego, Zielona Góra 2008.
Olszak W.: Obróbka skrawaniem. WNT Warszawa 2008.
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Additional:
Cichosz P., Narzędzia skrawające., WNT, Warszawa 2006.
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Grzesik W., Podstawy skrawania materiałów konstrukcyjnych., Wydawnictwo Naukowe PWN, 2018.
Jemielniak K.: Obróbka skrawaniem. Oficyna Wydawnicza Politechniki Warszawskiej - Warszawa 1998.
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Wieczorowski M., Cellary A., Chajda J.: Przewodnik po pomiarach nierówności powierzchni czyli o chropowatości i nie tylko. Politechnika Poznańska, Instytut Technologii Mechanicznej, Zakład Metrologii i Systemów Pomiarowych, Poznań 2003.
PN-EN ISO 4287:1999 - Specyfikacje geometrii wyrobów - Struktura geometryczna powierzchnii: metoda profilowa - Terminy, definicje i parametry struktury geometrycznej powierzchnii. 4
PN-ISO 3002-1+A1 - Podstawowe pojęcia w obróbce wiórowej i ściernej. Geometria części roboczej narzędzi skrawających. Terminologia ogólna, układy odniesienia, kąty narzędzia i kąty robocze oraz łamacze wióra.

Breakdown of average student's workload

	Hours	ECTS
Total workload	100	4,00
Classes requiring direct contact with the teacher	47	2,00
Student's own work (literature studies, preparation for laboratory classes/ tutorials, preparation for tests/exam, project preparation)	53	2,00