COURSE DESCRIPTION CARD - SYLLABUS

Course name

Coolants and cutting fluids

Course

Field of study

Mechanical Engineering

Year/Semester

4/7

Area of study (specialization)

Profile of study

general academic

Level of study

First-cycle studies

Course offered in

polish

Form of study

full-time

Requirements

elective

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr inż. Tadeusz Chwalczuk

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Responsible for the course/lecturer:

Prerequisites

1) The student has basic knowledge of physics, mathematics and mechanics.

2) The student is able to use the acquired knowledge to analyze new manufacturing techniques and knows how to use information obtained from the library and the Internet

3) The student shows independence in solving problems, acquiring and improving the acquired knowledge and skills, understanding the need to learn.

Course objective

To acquaint future engineers in the specialization of mechanical engineering with the latest methods of cooling the cutting zone, the design of tools enabling modern and ecological processing.

Course-related learning outcomes

Knowledge

1) Has an ordered, built-up knowledge of the strength of materials in the field of: changes occurring during the decohesion of the material resulting from the use of various cooling techniques and the design of cutting tools.

2) Has knowledge of materials science with elements of chemistry, including technical, natural and engineering materials - is able to assess the influence of cooling technique on the technological parameters of the surface layer, assesses changes in the material in terms of the microstructure of the processed material.

3) Has detailed knowledge of manufacturing techniques - construction of cutting tools that enable increasing cooling efficiency, construction of systems supporting gas cooling (MQL, cryogenic, gas).

Skills

1) Can obtain information from literature, databases and other properly selected sources in the field of cooling effects and techniques for various construction materials.

2) Can select tool materials for applications in cutting various construction materials with the use of cooling and lubrication techniques of the cutting zone.

3) Is able to select and apply cooling techniques due to the technologies of waste production.

4) Is able to make a preliminary economic analysis of the undertaken engineering activities, primarily the impact of cooling technology on the direct unit costs of cutting. Assesses the environmental cost of the machining cooling technology.

Social competences

1) Correctly identifies and resolves dilemmas related to the profession in the scope of the subject covered by the subject.

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written exam (in case of answers to: from 50 to 60% of questions - dst, above 60 to 70% - dst +, above 70 to 80% - db, above 80 to 90% - db +, above 90 to 100% - very good) .

Classes: Credit based on a little test conducted at the end of the semester. In the case of solving from 50 to 60% of the tasks - dst, above 60 to 70% - dst +, above 70 to 80% - db, above 80 to 90% - db +, above 90 to 100% - very good). To obtain credit for the exercises, the number of absences cannot exceed 1/3 of the classes.

Programme content

LECTURE includes:

analysis of the kinematics of the process, technological and geometric parameters for various cutting methods. Heat in the cutting process. Heat balance of the cutting process, friction in the process of decohesion of the workpiece. The influence of cutting temperature on the properties of the technological surface layer. Properties, classification and production of cooling and lubricating liquids. Conventional (flooded) methods of cooling tools and the cutting zone. Methods of temperature measurement in the cutting process. The influence of technological parameters of cooling on the durability of the blade. MQL technologies. Cooling with high media pressures. Gas cooling and cryogenic treatment. Construction of tools and cooling systems. Ecological aspects of using cooling lubricants.

LABORATORY consists of exercises during which students:

selection of a cooling liquid for a machining task, analyze the influence of cooling parameters on measurable values (machinability), compare the effects of using various cutting fluids, assess the operating condition of liquids and oils, learn about gas cooling technologies and minimal lubrication

Teaching methods

Lecture - giving methods: multimedia presentation, e-learning platform, discussion, consultation

Laboratory - searching methods: practice and practical, discussion, content analysis, group work

Bibliography

Basic

1. Jemielniak K., Obróbka skrawaniem. Podstawy, dynamika, diagnostyka, Oficyna Wydawnicza Politechniki Warszawskiej, 2019.

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

3. Dąbrowski J., Ciecze obróbkowe do skrawania metali, WNT, 1988

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

Additional

1. Honczarenko J., Elastyczna automatyzacja wytwarzania. Obrabiarki i systemy obróbkowe. Wydawnictwa Naukowo-Techniczne, Warszawa 2000.

2. Shaw M.C., Metal Cutting Principles. Oxford Univ. Press., Oxford 1996. 4) Hassan El-Hofy: Fundamentals of Machining Processes. Conventional and Nonconventional Processes. CRC Press 2019.

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	40	1,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	35	1,5

[1] delete or add other activities as appropriate