COURSE DESCRIPTION CARD - SYLLABUS

Course name
Basics of erosive machining

Course

Field of study
Mechanical Engineering
Area of study (specialization)

Level of study
First-cycle studies
Form of study
full-time

Year/Semester
4/7
Profile of study
general academic
Course offered in
polish
Requirements
elective

Number of hours

Lecture
15
Tutorials

Laboratory classes
15
Projects/seminars

Other (e.g. online)

Number of credit points

3

Lecturers

Responsible for the course/lecturer:
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Responsible for the course/lecturer:
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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

Acquainting future engineers with the characteristics of erosive machining and focusing them on acquiring knowledge in the field of new solutions and their evaluation.

Course-related learning outcomes

Knowledge

1) Has knowledge of erosive machining techniques including the essence and application of individual techniques, tool materials, technological parameters and indicators, and the surface layer.

Skills

1) Can find information on manufacturing processes in mechanical engineering, integrate the obtained information, interpret it, as well as draw conclusions and formulate and justify opinions about them.

2) Can develop an opinion on the technology of product manufacturing.

3) Is able to select modern erosion technologies for the implementation of production processes, increase the efficiency of production systems through integration activities.

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) .

Laboratory: Reports on exercises. To obtain credit for the laboratory, the number of absences cannot exceed 1/3 of the classes.

Programme content

LECTURE

1) Differences between machining and erosive machining, classification of erosive manufacturing techniques.

2) The essence and application of various methods of erosion treatment:

a) electrodischarge machining (sinking and wire cutting);

b) electrochemical machining (deburring, drilling holes, machining of shaped surfaces);

c) erosive blasting (waterjet and abrasive waterjet cutting; plasma cutting; laser cutting with oxidation, melting and evaporation; laser drilling of holes: single-pulse, multi-pulse, terpanation and spiral; laser and photochemical texturing; electron beam processing, hardening by laser, laser surface cleaning).

3) Structure, properties and application of individual types of lasers.

4) Surface layer after erosion treatment.

5) Parameters and technological indicators of individual methods of erosive machining.

6) Tool materials in electrodischarge and electrochemical machining.

LABORATORY

1) Parameters and effects of electrode sinking with a copper and graphite electrode.

2) Assessment of surface quality after laser, plasma and abrasive waterjet cutting.

3) Influence of technological parameters on the effects of laser drilling of holes.

4) Basics of programming of machining on an electrodischarge wire cutter.

5) Selection of laser hardening conditions.

Teaching methods

Lecture: multimedia presentation, discussion.

Laboratory: Practical method of realization of production tasks, instruction, discussion, work with a book.

Bibliography

Basic

1) Siwczyk M.: Obróbka elektroerozyjna. Technologia i zastosowanie. WNT, Warszawa 1981

2) Ruszaj A.: Niekonwencjonalne metody wytwarzania elementów maszyn i narzędzi. Wydawnictwo Instytutu Obróbki Skrawaniem, Kraków 1999

3) Jóźwicki R.: Technika laserowa i jej zastosowania, Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2009

4) Oczoś K.: Kształtowanie materiałów skoncentrowanymi strumieniami energii. Wydawnictwo Uczelaniane Politechniki Rezszowskiej, Rzeszów 1988

5) Zimny J.: Laserowa obróbka stali. Wydawnictwo Politechniki Częstochowskiej 1999

6) Mazurkiewicz A.: Konstytuowanie powierzchni i addytywne kształtowanie wyrobów obróbką laserową. Radom 2018

7) Radek N.: Laboratorium wiązkowych technologii obróbki materiałów. Wydawnictwo Politechniki Świętokrzstkiej, Kielce 2013

8) Albiński K., Miernikiewicz A., Ruszaj A., Zimny J.: Laboratorium obróbki erozyjnej. PWN, Warszawa 1980

Additional

1) Praca pod redakcją Żebrowskiego H.: Techniki wytwarzania. Obróbka wiórowa, ścierna i erozyjna. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004

2) John F. R.: Industrial applications of lasers. Elsevier Inc., 1997

3) Ion J. C.: Laser Processing of Engineering Materials: Principles, Procedure and Industrial Application. Elsevier Ltd., 2005

4) Hassan El-Hofy: Fundamentals of Machining Processes. Conventional and Nonconventional Processes. CRC Press 2019

5) Figurski J., Popis St.: Wykonywanie elementów maszyn, urządzeń i narzędzi metodą obróbki maszynowej. WSiP, 2015

6) Norma PN-EN ISO 9013:2017-04 Cięcie termiczne -- Klasyfikacja cięcia termicznego -- Specyfikacja geometrii wyrobu i tolerancje jakości

7) WORKING DRAFT ISO/WD Contact-free cutting — Water jet cutting — Geometrical product specification and quality

8) Dokumentacja maszyn technologicznych i programu CAD/CAM: elektrodrążarka Agie Charmilles Cabinet SP1U, laser diodowy TruDiode 3006 firmy Trumpf, wycinarka drutowa ACCUTEX AL400SA, program CAD/CAM Esprit Platinum

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