COURSE DESCRIPTION CARD - SYLLABUS

Course name

Advanced manufacturing processes

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

16

Laboratory classes

8

Other (e.g. online)

0

Tutorials

0

Projects/seminars

0

Number of credit points

3

Lecturers

Responsible for the course/lecturer:

dr inż. Marek Rybicki

Wydział Inżynierii Mechanicznej

Instytut Technologii Mechanicznej

ul. Piotrowo 3, 60-965 Poznań

pok. 605, tel.: +48616652752

hala 20, tel.: +48616652753

e-mail: marek.rybicki@put.poznan.pl

Responsible for the course/lecturer:

dr hab. inż. Damian Przestacki

Wydział Inżynierii Mechanicznej

Instytut Technologii Mechanicznej

ul. Piotrowo 3, 60-965 Poznań

pok. 620, tel.: +48616652850

e-mail: damian.przestacki@put.poznan.pl

Prerequisites

1) The student has basic knowledge of physics, mathematics, mechanics, the basics of material removal manufacturing processes

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 is independent in solving problems, acquiring and improving the acquired knowledge and skills, understanding the need to learn

Course objective

Acquainting with the characteristics of the latest solutions in the field of subtraction and focusing them on acquiring knowledge in the field of new solutions and their evaluation.

Course-related learning outcomes

Knowledge

1) Knows contemporary trends and development directions in the field of material removal technologies

Skills

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

2) Is able to develop an opinion on the manufacturing technology of the product

3) Can select modern material removal technologies for realization 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 field of the subject

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Lecture: Written exam (for answers to: 50 to 60% of questions - satisfactory, above 60 to 70% - satisfactory +, above 70 to 80% - good, above 80 to 90% - good +, above 90 to 100% % - very good)

Laboratory: Assessment of reports from individual exercises

Programme content

1) Micromachining (capabilities of various manufacturing methods in micromachining, machine tools for micromachining, role of cutting edge radius in micromachining)

2) Finish machining (grinding with ultrasonic assistance, honing, superfinishing, lapping, vibratory and rotary finishing, abrasive flow machining, abrasive blasting, brush deburring).

3) Burnishing for polishing and reinforcing of important surfaces.

4) Effects of various tools applying:

- during turning (wiper cutting inserts, skew turning),
- during milling (mills with various geometry and form of cutting edges),
- selection of thread machining method (tapping, burnishing, turning, milling) in view of time and quality of machining,
- current abilities of shaping/planing on turning and milling machines.

5) Erosion machining:

• electro-erosion machining (electro discharge and wire electro discharge machining)

• electro-chemical machining,

• stream-erosion machining: cutting (by laser, waterjet and abrasive waterjet, plasma, electron beam), other lasers applications in manufacturing (cleaning, texturing, engraving, marking, cladding, drilling, selective sintering etc.)

6) Trends in manufacturing processes:

• hard machining HM,

• high speed macining HSM and high performance machining HPM,

• complete machining,

• new techniques of cooling/lubrication of cutting zone (MQL, MQCL, SSP, HPC etc.),

• hybrid machining.

Teaching methods

Lecture: multimedia presentation, discussion

Laboratory: performing laboratory exercises and developing reports according to the instructions in the outline

Bibliography

Basic

1. Filipowski R., Marciniak.: Techniki obróbki mechanicznej i erozyjnej. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2000

2. Erbel J. (red.): Encyklopedia technik wytwarzania w przemyśle maszynowym tom II. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001

3. Harasymowicz J; red. Wantuch E., Obróbka gładkościowa: skrypt dla studentów wyższych szkół technicznych; Politechnika Krakowska im. Tadeusza Kościuszki. Kraków 1994

4. Żebrowski H. : Techniki wytwarzania. Obróbka wiórowa, ścierna i erozyjna. Oficyna Wydawnicza Politechniki Wrocławskiej, Wrocław 2004

5. Grzesik W.: Podstawy skrawania materiałów konstrukcyjnych, WNT Warszawa 2010.

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

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

8. Harasymowicz J; red. Wantuch E., Obróbka gładkościowa: skrypt dla studentów wyższych szkół technicznych; Politechnika Krakowska im. Tadeusza Kościuszki. Kraków 1994

9. Oczoś K., Kształtowanie materiałów skoncentrowanymi strumieniami energii. WUPR, Rzeszów 1988.

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

Additional

1. Oczoś K., Efektywność innowacyjnych technologii na przykładzie wybranych sposobów obróbki strumieniowo-erozyjnej, Mechanik, 2003 nr 8-9, s. 463-468

2. Hassan A.G., Fundamentals of Machining Processes: Conventional and Nonconventional Processes. CRC Press, 2013

3. Gupta K., Jain, Neelesh K. J., Laubscher R. F., Hybrid Machining Processes: Perspectives on Machining and Finishing. Springer, 2016

4. Grzesik W., Advanced Machining Processes of Metallic Materials: Theory, Modelling and Applications. Elsevier, 2008

5. John F. R., Industrial applications of lasers. Elsevier Inc., 1997

6. Brandt M., Laser Additive Manufacturing:Materials, Design, Technologies, and Applications. Woodhead Publishing, 2016

7. Davim J.P., Jackson M.J. Nano and Micromachining. John Wiley & Sons, Inc., NJ USA 2009.

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

9. E. Paul Degarmo, J. T. Black, Ronald A. Kohser: Materials and Processes in Manufacturing. Wyd. 9. Wiley, 2003

Breakdown of average student's workload

	Hours	ECTS
Total workload	75	3,0
Classes requiring direct contact with the teacher	27	1,1
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) [1]	20	0,8

[1] delete or add other activities as appropriate