



COURSE DESCRIPTION CARD - SYLLABUS

Course name

Modern tool materials

Course

Field of study

Material Science and Engineering

Area of study (specialization)

Metal materials and plastics

Level of study

Second-cycle studies

Form of study

full-time

Year/Semester

1/2

Profile of study

general academic

Course offered in

polish

Requirements

compulsory

Number of hours

Lecture

15

Laboratory classes

15

Other (e.g. online)

Tutorials

Projects/seminars

Number of credit points

2

Lecturers

Responsible for the course/lecturer:

dr hab. inż. Andrzej Miklaszewski

Responsible for the course/lecturer:

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Wydział Inżynierii Materiałowej i Fizyki

Technicznej

Piotrowo 3, 61-138 Poznań

Prerequisites

The student possesses the basic knowledge in physics, mathematics, mechanics, materials science. He can use the acquired knowledge to analyze specific tool materials and knows how to use information obtained from the library and the Internet. 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 modern tool materials and tool nanomaterials with accompanied technological possibilities.



Course-related learning outcomes

Knowledge

1. Can characterize materials, tool nanomaterials and technological possibilities, - [K_W06]
2. Has knowledge of the types of tool materials and methods of their production - [K_W04]

Skills

1. Can select the material, nanomaterial to make a given part - [K_U01 K_U13]
2. Can distinguish between material, nanomaterial - [K_U13]
3. Can communicate using the basic concepts and quantities in the field of materials, nanomaterials contained in books, magazines, company materials - [K_U02]

Social competences

1. Can solve dilemmas in the field of modern materials. Nanomaterials on the level of modern economy and society - [K_K06]

Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Credit based on a test conducted at the last class in the semester (in the case of answers to: from 50 to 60% of questions? Dst, over 60 to 70% - dst +, over 70 to 80% - db, over 80 to 90% - db +, over 90 up to 100% - very good)

Programme content

Lecture

Modern tool materials

Mechanisms and wear factors of tool materials

Powder metallurgy and manufacturing processes of tool materials

Tool steels

Tungsten carbide and stellite

Cermets

Tool ceramics and mechanisms of its strengthening

Super hard materials

Properties of surface layers, expectations, classification, characteristics of production methods

SWOT analysis

Examples of applications of anti-wear coatings



Lab

Assessment and selection of technological parameters for the production of tool materials on the matrix of the binding phase

Manufacture of microcrystalline composites on the matrix of a metallic phase by powder metallurgy

Production of nanocrystalline composites based on a metallic phase by powder metallurgy

Assessment of the basic physical properties of the produced sinters (density, porosity)

The influence of grain size on the technological and mechanical properties of the produced composites

The influence of the ceramic phase share on the technological and mechanical properties of the produced composites

Teaching methods

1. Lecture: multimedia presentation, presentation illustrated with examples given on the blackboard.
2. Laboratory exercises: practical exercises, discussion and preparation of the results in the form of a report, formulation of conclusions concerning the issues discussed during classes.

Bibliography

Basic

1. Erbel J. (red.): Encyklopedia technik wytwarzania w przemyśle maszynowym tom II. Oficyna Wydawnicza Politechniki Warszawskiej, Warszawa 2001
2. M. Kupczyk., Wytwarzanie i eksploatacja narzędzi skrawających powłokami przeciwzużyciowymi, Wyd. PP 2009.
3. Nanonauki i nanotechnologie, A. Mazurkiewicz (Red.), Wyd. Instytutu Technologii Eksploatacji, Radom 2007
4. M. Jurczyk, Nanomateriały, Wyd. PP 2001
5. M. Jurczyk, J. Jakubowicz, Nanomateriały ceramiczne Wyd. PP 2004
6. M. Wysięcki, Nowoczesne materiały narzędziowe, WNT Warszawa 1997
7. J. Nowacki, Spiekane metale i kompozyty z osnową metaliczną, WNT Warszawa 2005

Additional

Czasopisma naukowo-techniczne: Mechanik, Przegląd Mechaniczn



Breakdown of average student's workload

| | Hours | ECTS |
|---|-------|------|
| Total workload | 70 | 2,0 |
| Classes requiring direct contact with the teacher | 35 | 1,0 |
| Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) ¹ | 35 | 1,0 |

¹ delete or add other activities as appropriate