



## COURSE DESCRIPTION CARD - SYLLABUS

Course name

Non-metallic materials

### Course

Field of study

Year/Semester

Transport

1/2

Area of study (specialization)

Profile of study

general academic

Level of study

Course offered in

First-cycle studies

Polish

Form of study

Requirements

part-time

compulsory

### Number of hours

Lecture

Laboratory classes

Other (e.g. online)

9

0

0

Tutorials

Projects/seminars

### Number of credit points

1

### Lecturers

Responsible for the course/lecturer:

Responsible for the course/lecturer:

dr hab. inż. Marta Paczkowska email:

marta.paczowska@put.poznan.pl

tel. 616475906 Faculty of Civil Engineering and

Transport

### Prerequisites

Knowledge: The student should have knowledge of basic sciences, i.e. physics and chemistry, as well as knowledge of subjects carried out at the first degree of studies, i.e. physical chemistry, thermodynamics, mechanics, material strength, machine construction.

The student should demonstrate the general ability to identify problems, create algorithms, ways of solving them and the ability to solve engineering tasks.

The student should understand the basic phenomena occurring in solids, be able to identify and characterize them.

Social competences: The student is ready to deepen the knowledge of interdisciplinary subjects. The student is open to learning about new technologies and engineering solutions.



## Course objective

The aim of the course is to familiarize students with such materials as plastics, ceramics and composites. In particular, getting acquainted with their structure and properties.

## Course-related learning outcomes

### Knowledge

Student has knowledge of significant directions of development and the most important technical achievements and other related scientific disciplines, in particular transport engineering

### Skills

Student can obtain information from various sources, including literature and databases, both in Polish and in English, integrate them properly, interpret and critically evaluate them, draw conclusions, and comprehensively justify their opinions

### Social competences

Student is aware of the social role of a technical university graduate, in particular understands the need to formulate and transfer to the society, in an appropriate form, information and opinions on engineering activities, technological achievements, as well as the achievements and traditions of the profession of a transport engineer

## Methods for verifying learning outcomes and assessment criteria

Learning outcomes presented above are verified as follows:

Written verification

## Programme content

Classification of basic groups of engineering materials: metals and their alloys, plastics, ceramics and glass, composites.

Plastics, polymer structure, covalent and van der Waals bonds, crystalline and amorphous structure, manufacturing methods, polymer processing, molding, properties, types (plastomers, elastomers), examples of use.

Selected properties of ceramic materials and composites their assessment: general properties (density, viscosity, melt index, mechanical properties (yield stress, elongation

relative at the yield point, tensile strength, modulus of elasticity in tensile,

bending strength), impact strength (Charpy, Isode method), hardness (Rockwell,

pressing the ball).

Selected properties of ceramic materials; dielectricity, poor electrical conductivity,

resistance to heat shocks, asymmetry of compressive and tensile strength



Processing of ceramics; forming by: rolling, drawing, spreading, blow ironing, glass fiber drawing, isostatic ironing (e.g. candles ignition), extruding with a screw press, turning (in plaster and on a mold plaster), casting in plaster mold.

Special ceramic materials and their properties and used in industry: carbon fibers, diamond, nanotubes, fullerenes.

Special types of composites, their properties and application: metal matrix composites

particle hardening, dispersion hardening, sinters based on non-ferrous metals, metal-ceramic, sintered carbides, cermets, fiber composites, layer composites.

Composites manufacturing methods:

Selection of engineering materials for the construction of selected engineering structures: for a beam, for a mirror telescope, on some elements of the car (bodywork, bumpers), on elements of houses (e.g. walls external-bearing).

### Teaching methods

Lecture with multimedia presentation

### Bibliography

Basic

1. L. A. Dobrzański: Podstawy nauki o materiałach i metaloznawstwo, WNT, Gliwice 2002
2. K. Przybyłowicz, J. Przybyłowicz, Materiałoznawstwo w pytaniach i odpowiedziach, WNT, 2009
3. M. Ashby i in.: Inżynieria materiałowa tom I i II, Wydawnictwo Galaktyka, 2006
4. M. Ashby i in.: Materiały inżynierskie tom I i II, WNT, 1996
5. W. Domke: Vademecum materiałoznawstwa, NT, 1997
6. L.A. Dobrzański, R. Nowosielski: Metody badania metali i stopów. Badania własności fizycznych. WNT, W-wa, 1987

Additional

1. Mały poradnik mechanika, tom I i II, WNT, 2002
2. L. A. Dobrzański.: Metaloznawstwo z podstawami nauki o materiałach, WNT, 1998;



### Breakdown of average student's workload

	Hours	ECTS
Total workload	24	1,0
Classes requiring direct contact with the teacher	9	0,5
Student's own work (literature studies, preparation for laboratory classes/tutorials, preparation for tests/exam, project preparation) <sup>1</sup>	15	0,5

<sup>1</sup> delete or add other activities as appropriate